MILITARY REVIEW

MARCH 1946 · VOLUME XXV · NUMBER 12

COMMAND AND GENERAL STAFF SCHOOL

FORT LEAVENWORTH, KANSAS

A MONTHLY REVIEW OF MILITARY LITERATURE

The March number of the MILITARY REVIEW completes the first year of the Spanish-American and Brazilian editions. The enthusiasm with which these editions have been received by our comrades in arms in the Americas is a source of satisfaction to the Commandant and the members of the staff and faculty of the Command and General Staff School and an incentive to the editors.

VOLUME XXV MARCH 1946 NUMBER 12

MILITARY REVIEW

CONTENTS

COMMAND AND GENERAL STAFF SCHOOL

LIEUTENANT GENERAL L. T. GEROW	Commandant
MAJOR GENERAL O. P. WEYLAND	Assistant Commandant
BRIGADIER GENERAL W. A. CAMPBELL	Coordinating Director of Instruction
BRIGADIER GENERAL A. W. PENCE	Director, Service Instruction
CAPTAIN J. B. EARLE, *United States Navy*	Director, Naval Instruction
COLONEL WILLIAM NALLE, *Cavalry*	Director, Ground Instruction
COLONEL R. C. CANDEE	Director, Air Instruction
COLONEL D. C. SCHMAHL, *Field Artillery*	Executive
LIEUTENANT COLONEL W. R. KREINHEDER, *Coast Artillery Corps*	Assistant Secretary

Class Directors

MAJOR GENERAL WILLIAM F. DEAN	Command
COLONEL J. H. VAN VLIET, *Infantry*	Ground
COLONEL W. J. BAIRD, *Infantry*	Service
COLONEL PHILLIPS MELVILLE, *Air Corps*	Air
COLONEL W. H. HENNIG, *Coast Artillery Corps*	Latin American Class

Faculty Chiefs

COLONEL H. J. SCHROEDER, *Signal Corps*	Personnel
LIEUTENANT COLONEL A. M. CLARK, *Air Corps*	Intelligence
COLONEL S. A. GIBSON, *Infantry*	Operations
COLONEL T. DeF. ROGERS, *Corps of Engineers*	Logistics
COLONEL L. H. COOK, *Infantry*	Ground
COLONEL E. E. BATES, JR., *Air Corps*	Air
COLONEL F. J. FRESE, JR., *Medical Corps*	Service
LIEUTENANT COLONEL W. B. MCCALL, JR., *Infantry*	Training

MILITARY REVIEW — Published monthly by the Command and General Staff School at Fort Leavenworth, Kansas. Entered as second-class matter August 31, 1934, at the Post Office at Fort Leavenworth, Kansas, under the Act of March 3, 1879. Subscription rates: $3.00 (U. S. currency) per year for 12 issues. No extra charge for foreign postage on new or renewal subscriptions.

The Quartermaster Troop Problem In Europe, VE-Day to VJ-Day

MAJOR GENERAL ROBERT M. LITTLEJOHN
Theater Chief Quartermaster, U.S. Forces, European Theater

WORLD War II proved to be a war of supply. The magnitude of the logistical problems is familiar, in terms of the global character of the war, in terms of the shipping, unloading, and distribution task, and in terms of the unprecedented tonnage and variety of supplies. Not so familiar is the way in which the service forces accomplished their mission by using every conceivable expedient to overcome the handicap of an inadequate number of troops. Perhaps one of the greatest contributions of the service forces was in this field.

It is ever the objective to place a maximum number of men in the line, supported by the minimum number of men to supply them efficiently. Personnel allocations, throughout the war, sought that goal. To the service forces, whose troop allotments were held to a minimum, the multiplication of the effectiveness of available troops was the only way to get the job done. Illustrative of how vital this consideration proved to be was the troop situation in Europe between VE and VJ-day, when it was necessary to mount an exceedingly complex operation with a sharply decreased number of service troops.

ETO as a Supply Base

For more than three months, the European Theater was a supply base and personnel pool for the Pacific. In that brief time, service forces performed a feat which taught lessons that later may not appear in proper perspective. Germany's collapse appeared, until mid-August, to be only another milestone on the long road to world peace. There was nothing in Japan's war record to support an expectation of surrender, and the world was resigned to another year or two years of war to hammer Japan into submission. In retrospect, however, it is easy to view early victory as a foregone conclusion.

Later developments notwithstanding, when the last shot was fired in Germany, the European Theater's mission instantly ended as a striking force and became that of a supply base for the Pacific. No time could be lost in bringing additional power to bear on Japan, and the shift in Europe had to be accomplished with a minimum of dislocation. Any gradual change of emphasis before German surrender would have weakened the final drive.

To combat elements, German defeat meant, at least temporarily, completion of their job; to most service troops it meant longer hours and harder work. To the Quartermaster Corps, in particular, it meant a continuation of the theater supply program and the concurrent task of implementing the outmovement. Simultaneously, Quartermaster units had to be furnished for redeployment, which began on a full-scale basis in June.

It was the heavy losses of troops, at the very time when service requirements suddenly increased, that presented the most difficult Quartermaster problem. How the problem was being met when the war ended is a study in the flexibility of our Army.

The QM Troop Position on VE-Day

When Germany surrendered on 8 May 1945, the Quartermaster Corps in Europe had a troop unit strength of 133,580, or 4.32 percent of the American forces in the theater. VE-day strength included some 1,100 Quartermaster units, ranging from office-machine repair teams to base depot headquarters. These service troops were dispersed from Northern Ireland to Southern France and from Paris to Central Germany. Although comparison is rendered difficult by certain striking differences in mission and campaign conditions, it is interesting that Quartermaster troops were 5.2 percent of our European force in World War I.

Throughout the campaign, the field forces were given priority on Quartermaster units, as they arrived to fill the theater troop basis, since only military personnel could be em-

ployed in the forward areas. Rear-area units increased their labor potential by drawing on other sources of manpower. At VE-day, the Quartermaster Corps was utilizing the services of 145,355 additional workers. They included 52,733 civilians, 89,265 prisoners of war, and 2,357 French and Belgian troops. Their assistance was not only in manual labor but in skilled clerical and supervisory fields. The limiting factor in the employment of this type of personnel was the amount and kind of military supervision needed to make it effective. At VE-day, the number of these workers was close to the economical absorption point.

Redeployment Requirements

Outmovement of troops from Europe was scheduled over a one-year period, beginning 1 June 1945. Requirements were set forth in detail in three major War Department documents—editions of the Atlantic Forecast.

The first edition, published a month before the defeat of Germany, set the general scheme. It listed, by month, the units to depart for the Pacific Ocean Area, for China-Burma-India, and those to be sent to the United States for demobilization, strategic reserve, or later redeployment. Included was a schedule of units to be activated in the European Theater. Despite later revisions, this edition set the broad pattern to be followed in withdrawing troops from Europe.

The first forecast called for outmovement, during the first three months, of some 637,000 troops, or 20.7 percent of the European Theater troop basis. Of these, 33,486 were to be Quartermaster troops, representing twenty-five percent of the Quartermaster troop basis for the theater.

Alterations in global strategy resulted in the sudden quickening in redeployment tempo, established by the second edition of the Atlantic Forecast, which appeared a week after Germany's surrender. Plans for first-quarter theater outflow rose sharply to some 1,017,000 troops, or 33.1 percent of the theater troop basis. Quartermaster requirements were stepped up to 46,368, or 34.6 percent of the Quartermaster troop basis. Almost the full effect of the upward revision in Quartermaster outmovements was in requirements for the first month.

A rise to 1,050,000 in first-quarter requirements for the theater was called for in the third forecast which appeared in mid-July. This represented 34.2 percent of the theater troop basis. Rescheduling, however, resulted in a slight lowering in demands for Quartermaster troops to 42,467, or 31.4 percent of the Quartermaster theater troop basis. This slackening was brought about by a rephasing, until later months, of certain units.

Capitulation of Japan brought no great change in the volume of first-quarter (June-July-August) theater troop losses. In the final two weeks of the quarter, the troop shipment pipeline was being cleared of low-point men, slated for Pacific destinations, to make way for high-point men who were going home. By that time, well over a million men had left the theater. A third of the military manpower had gone since VE-day.

Upon cessation of fighting in Europe, redeployment schedules gave outmovement requirements precedence over continental operations. There was every indication that it would take many more agonizing months to defeat Japan, and it was logical to shorten the struggle by diverting all possible power from Europe to the Pacific. Still, this diversion increased the Quartermaster problem in Europe an estimated twenty-five percent. A discussion of the magnitude of the problem is essential to a full understanding of the way it was being met, in spite of diminishing troop strength.

QM's Task Increases During VE-VJ Period

There is much truth in the theory that "an army can get along in combat." When troops are in the field, they do a lot of improvising and do not want the encumbrance of more than the bare essentials. The simpler they are able to make their lives, the more efficient they are as a mobile force. When Europe converted to garrison life after the German surrender, the American soldier wanted to leave behind the rigorous field life and settle down to comfortable living. He required, and was entitled to, more service and supplies. This conversion to garrison life amounted

Major Quartermaster Units in European Theater of Operations on VE-Day and Requirements for First-Class Outmovement

Unit	*In ETO VE-Day*	*ETO Out (1st Edition) (5 April)*	*ETO Out (2d Edition) (15 May)*	*ETO Out (3d Edition) (19 July)*
Hq/Hq Co QM Base Depot	17	3	4	4
Hq/Hq Det QM Group	34	9	9	7
Hq/Hq Det QM Bn	105	26	37	38
Hq/Hq Det QM Bn (M)	23	3	7	7
QM Bakery Co	3	—	20	21
QM Bakery Co (M) Sp	55	12	22	—
QM Base Depot Co	7	4	4	4
QM Depot Supply Co	45	6	11	10
QM Fumigation & Bath Co	24	8	18	18
QM Gas Supply Co	83	7	18	18
QM Graves Reg Co	23	6	7	7
QM Ldry Co (SM)	40	15	12	12
QM Petrol Lab (M) (FB)	6	1	1	1
QM Petrol Lab (S) (FA)	6	2	1	1
QM Railhead Co	60	13	17	17
QM Refrig Co (M)	10	3	6	6
QM Refrig Co (F)	11	4	7	7
QM Sales Co (M)	6⅔	3	2	2
QM Salv Coll Co	21	7	10	10
QM Salv Rep Co (F)	3	1	1	1
QM Salv Rep Co (SM)	22	8	9	9
QM Service Co	268	48	75	77
QM Steril Co	15	7	—	—
QM Supply & Sales Co	1	—	1	1
Comp Co Hq (AC)	66	—	6	—
Ldry Sec (EJ)	97	23	61	61
Ldry Det (M) (EA, EB)	—	—	25	25
Ldry Sec (Hosp) (EJ, 4JB)	—	—	10	8
Total QM T/O Strength	133,580	33,486	46,368	42,467
Percent of Total QM Troop Basis		25	34.6	31.4
Total Theater Outflow (Est)		637,000	1,017,000	1,050,000
Percent of Total Outflow to ETO Troop Basis		20.7	33.1	34.2

to a complete re-equipment of all of the field forces.

Re-outfitting the field forces entailed heavy issues from Quartermaster stocks, which were further increased by the vast program of re-equipping, for special conditions, units being redeployed to other theaters.

In both phases of the re-equipment program, worn clothing and equipment, which were being replaced, began pyramiding on

top of a VE-day salvage backlog of 10,209 long tons. Speed was essential in reconditioning this salvage and returning it to supply channels to be applied against War Department and theater requirements.

New installations had to be opened, supplied, and staffed to support the heavier supply and salvage activities, months before existing facilities could be closed. Examples were the 300,000-man Assembly Area Command, staging areas surrounding redeployment ports, and the Bremen Enclave.

Supply and service for our own troops were by no means the only increased problems. A tremendous number of prisoners, recovered Allied military personnel, and displaced persons suddenly flowed in shortly before VE-day, and became Army charges. On 1 May the army was feeding 6,412,378 persons, including over 2,000,000 prisoners, 300,000 French military, and 78,000 liberated persons. This figure did not include the millions of displaced persons, for whom Civil Affairs supplies were wholesaled by the Quartermaster Corps. The speed of the final drive in Germany resulted in combat units caring for displaced persons until Civil Affairs could take over the work.

Further new problems included the redistribution of supplies in order to concentrate them in a few forward areas, outshipment of equipment to other theaters, getting under control large stocks of captured materials, and the re-establishment and control of manufacturing in Germany.

Other Complications in QM Troop Problem

In accomplishing the increased mission, while troop strength waned, the Quartermaster Corps had to cope with many dislocations caused by the loss of specific types of units. In the face of a loss to duty of twenty-one bakery companies, for instance, it appeared necessary to increase the prisoner bread issue from seventy to ninety-five pounds a day per hundred men to effect savings in other components of the ration.

In the loss of Quartermaster units of all types, the toll was far greater than shipment schedules indicated, since, as a general rule, units were lost to duty about sixty days before their departure from Europe. With few exceptions, this had the effect of removing from duty, in June, all of the Quartermaster units scheduled to leave during the first three months. Statistics make this point clear. By 30 June, 11.4 percent of the theater strength had departed, while 31.7 percent of the Quartermaster troops had been lost to duty. This meant that eighty-nine percent of the theater needed increased service from sixty-nine percent of the Quartermasters.

The remaining sixty-nine percent of the Quartermaster troops were, it cannot be denied, less efficient than they had been early in the spring. There were two definite reasons for lowered efficiency: recent losses of physically qualified men to combat units, which had been met in part by the upgrading of men remaining in the service units; and an intangible "let-down" period which, quite naturally, followed victory over Germany.

How the QM Troop Problem was Being Solved

Exploitation of non-military sources of manpower was the greatest single aid in solving the Quartermaster problem of having to do a bigger job with fewer troops. From VE to VJ, non-military personnel on Quartermaster duties rose from 145,355 to 171,226. They were civilians, prisoners of war, Italian cooperators, French and Belgian troops, and displaced persons of many nations.

Additional help was forthcoming from the mere increase in numbers of these workers, but greater effectiveness of the individual workers provided the real answer. On VE-day a program was already well established to enable them to be almost wholly self-sufficient in operation. This training took two forms: a continuation of on-the-job individual training in all installations, and newly-organized groups of workers, presenting all of the difficulties of language barriers, temperament, ability, work habits, and reliability.

On-the-job training of individuals had developed proficient clerical and supervisory workers who were able, when the time came, to work almost without supervision. A good example is the 52d Quartermaster Base Depot, which was able, on 31 May, to open a sub-depot wth one officer, two enlisted men,

and 710 civilians. Both the 64th and 55th Quartermaster Base Depots in Reims ran many warehouses and shops almost entirely with prisoners.

Displaced persons and prisoners were organized into units, after the manner of Italian service companies, and trained to function as organizations. These units were able to replace American troops at such work as bakery, laundry, depot, and railhead operations. This expedient would not have been feasible if authority had not been obtained to hold, in Europe, a substantial amount of special-purpose equipment of Quartermaster units being redeployed. The beneficial result was that Quartermaster troops could be more widely dispersed on technical activities.

Another boost in the degree of efficiency of remaining Quartermaster troops came with their progressive relief from guard duties, by French and Belgian troops, Russian, Polish, and Jugoslav nationals, and men from our own line organizations. This enabled the Quartermaster troops to devote their energies to technical supervision.

Although it was not until mid-July, help came from another direction when several field-force units were made available for Quartermaster operations. These line organizations, mostly antiaircraft and field artillery units, were phased for late redeployment to the United States, where they were to be inactivated. Since shipping was not to be available to them until late in the year, the men were not averse to occupying their time at supply duties and worked well. They were activated into provisional units, in some cases, by the base sections. Immediately upon arrival at Quartermaster installations, they assisted in guard functions and, gradually, on-the-job training qualified them for technical operations. Quartermaster troops became available for wider dispersal.

A limited number of line officers, who were made available for Quartermaster work, were given a short course in supply theory at the Ile St. Germain, near Paris, and were assigned to Quartermaster duties.

Installations also averted dislocations, when their units were lost through redeployment, by internal shifting of Quartermaster technicians so that men from several units were engaged in each activity. The loss of any one unit could not, in that way, disrupt operations.

Unexpected VJ Alters Picture

The sudden, unheralded capitulation of Japan brought an immediate end to the theater's role as a supply base and personnel pool for the Pacific. It was no longer necessary to send troops and supplies to the new theater. There was no more re-equipping for combat and less urgency about the salvage program. The European theater had accomplished a lightning change, on a war footing, and was ready for the job of sending the men home as fast as the ships could carry them.

The problem of supply redeployment changed to one of supply disposal through outshipment, consumption in the theater, stockage of the zone of occupation, or disposition in Europe.

Quartermaster installations had changed considerably in three months. In April a truck driver stopped in a depot, dealt with GI's, and drove away with the supplies he needed. In August he still got the supplies, but he needed an interpreter and rarely saw a GI.

Leadership in the field depends to an important extent on one's legs, and stomach, and nervous system, and on one's ability to withstand hardships, and lack of sleep, and still be disposed energetically and aggressively to command men, to dominate men on the battlefield.

—General of the Army George C. Marshall

The Air-Ground Team

CAPTAIN JAMES B. L. RUSH, *Infantry*
Instructor, Ground Liaison Officers School
Key Field, Mississippi

The author is a graduate of the Ground Liaison Officers School at Key Field, Mississippi. After graduation he was assigned as a Ground Liaison Officer (GLO) to Headquarters, U.S. Third Army, then in England, and attached to a fighter-bomber group, which participated in the pre-invasion air offensive, the First Army's invasion of Normandy, the Third Army's breakout of the beachhead and drive through Northern France, and later in the Seventh Army's drive to the Rhine and assault on the Siegfried Line. In February 1945 he was ordered back to the States as an instructor at the GLO School at Key Field.—THE EDITOR.

ARE the air and the ground a team? Now that the war has been successfully concluded, and battle reports are available, it can be stated with certainty that they are a team.

This is not entirely a one-sided question. Among the more prominent arguments against the above statement are: (1) the dive-bomber is capable of only limited assistance to the front-line infantry; (2) there is no machinery by which assistance from the air can be given to the ground forces; (3) the Air Forces have nothing to correspond to the direct-support artillery of the Ground Forces; (4) teamwork is difficult to attain between air and ground forces; (5) there is no personal or mutual contact and interest; (6) there is no rehearsal ahead of time.

However valid these criticisms may have been only a few years ago, they do not hold today, nor have they held since early in the Italian Campaign when the Fifth Army-XII Tactical Air Command began to function.

It is invidious to liken the air force to the artillery, then state that the air-ground teamwork cannot compare with the infantry-artillery teamwork. Of course it cannot. The infantry regiment and the field artillery battalion, two comparatively small units, both operating in a comparatively small area, form the infantry-artillery team. The air-ground team begins at a much higher level: the Army-Tactical Air Command (TAC). From these headquarters, the liaison goes forward to the units of the army, and to the rear, to the units of the tactical air command. Just as the army has corps and divisions to carry out its mission, the TAC has fighter (fighter-bomber) groups and reconnaissance—photo and visual—squadrons.

The teamwork between these large units, the army and the tactical air command, is based on three factors: the army and TAC occupy joint headquarters, thus making personal contact of officers and mutual exchanges of problems and ideas feasible; secondly, the exchange of specially qualified ground officers so that each ground unit has an air officer and each air unit a ground officer attached; thirdly, a private system of communication between air and ground units through army headquarters for the exchange of pertinent information and over which requests for air attack can be made by ground units.

Looking at the team more closely, we find that each division, corps, and army headquarters has an Air-Ground Liaison Section (AGLS), manned by organically assigned ground personnel who have been especially trained in air-ground cooperation at special schools in the States and abroad. The officers in these sections are called Air-Ground Liaison Officers (AGLO) and operate as a subsection of G-3.

The Army Air-Ground Liaison Section is much larger than the division and corps sections, and performs more complicated duties. The section is divided into two parts: Four officers and eight enlisted men remain with army headquarters and run the Air-Ground Information Center (AGIC); while twelve officers, officially titled Ground Liaison Offi-

cers, and twelve enlisted clerk-drivers go to the fighter and reconnaissance units of the tactical air command. Radio teams are sent from the army section forward to the AGLS of each division and corps, and to each air unit at which a GLO is located. The net control stations are located at the AGIC at army, thus giving all elements of the team a means of communication. All other communications available—teletype, telephone, etc.—are also utilized, but the radio is exclusively for the AGLS.

In addition to these specially trained ground officers, the tactical air command sends flying officers—generally called forward controllers—to divisions and corps. These officers are usually experienced fighter-bomber pilots, and are equipped with VHF [very high frequency] radio to brief pilots in the air on close-cooperation missions. The forward controllers may also act as advisers to the ground commanders in air matters, but they do not exercise any command, nor can they veto air requests. This veto is exercised only in higher ground headquarters, with final say at Army-TAC.

Through the Air-Ground Information Center there is a complete and continuous exchange of all kinds of information between the air and ground forces, so that the air units, through the GLO's, know exactly what the ground units are doing; while the ground units, through the AGLO's, know what the air units are doing.

Specifically, the AGIC at army headquarters (1) controls and supervises the functioning of the air-ground liaison sections within the army, as well as the GLO sections at air units; (2) receives, records, and distributes current air-ground information; (3) transmits current bomb safety line information; (4) prepares all air requests for the approval of army and for submission to TAC; (5) keeps appropriate air-ground liaison sections and the GLO teams informed of the details of planned air operations, actions upon air-mission requests, refusals, and the like; (6) consolidates all requests for visual and photographic (air) reconnaissance, coordinates these requests with Army G-2, and submits the approved requests to the TAC.

The GLO's maintain operations maps showing the bomb safety line and the disposition of friendly and enemy ground forces, assist in the briefing and interrogation of combat crews with emphasis on the ground picture, transmit results of air missions to the AGIC to be sent forward to interested ground units, and in general are the fount of all ground information for the air unit to which they are assigned.

It rests ultimately with the GLO teams at the air units to arrange for the personal relationships between air and ground. Originally, exchange visits between personnel of air and ground units were arranged by the GLO's. Later, in the European Theater of Operations it became the stated policy of higher commanders that such visits be expedited whenever possible without interfering with operations. Likewise in the Pacific every effort was made to let the fliers see the war on the ground, and ground personnel see the war in the air.

The pilots of tactical air units are always briefed, usually by the GLO, on the ground situation on close-in missions, and often the pilots are given the ground picture at every briefing, whether the mission is one of ground cooperation or bomber escort.

The GLO insures that the pilots know not only the target they are to hit and what troops are near the target, but also its significance. In the event the mission is one of "air alert," where the squadron reports in to the ground controller and is briefed in the air for a direct-support attack, the significance of the mission may not be passed over the air. The GLO, however, by giving talks on the ground situation in addition to the regular briefings, has given the pilots a sufficient appreciation of the ground situation for them to realize the importance and significance of the attack they are about to make.

It is true that there is no rehearsal before an attack, but who in combat has a chance

to rehearse every operation? Pilots are briefed from the best available maps and photographs. They always carry maps, sometimes several of varying scale (to fly by and for target finding). Photographs of the target areas are carried when available. Unless the pilot is on his first combat mission, he is familiar with the terrain beneath him from having flown over it almost daily. Tactical air commands do not operate all over the map, but in carefully restricted areas, bounded laterally by the boundaries of the army with which they are working, and in depth by the range of the plane.

Although there are some transfers of air units from one tactical air command to another, and divisions from one army to another, the order of battle remains generally the same. Thus the same squadrons and groups operate in conjunction with the same divisions for long periods of time. This situation, coupled with the other liaison methods mentioned above, creates mutual trust and the feeling of being members of the same team.

Teamwork by personal contact is much more obvious at the army and TAC headquarters, whose personnel work and live side by side. On this level it is continuous and very personal. Although lacking this continuous personal contact, the divisions and air units lack none of the mutual interest and contacts evidenced in the high headquarters.

A common practice in the ETO was the painting of distinctive markings on the planes of the various fighter-bomber groups, such as bright orange tails, so that the ground troops might know, day after day, the air units cooperating with them. Fighter-bomber attacks were made closer and closer as the confidence of the ground units in the cooperating air unit increased. Three hundred yards, and even closer, was SOP.

The missions of the tactical air command give the key to what the ground forces may expect from the air. The missions are three: (1) to provide visual and photographic reconnaissance for itself and its cooperating army; (2) air defense of the army-TAC battle area; (3) attack in three priorities—viz., to gain and maintain aerial superiority, to isolate the battlefield, and thirdly, to participate in the ground battle. The Air-Ground Liaison System provides the harness within which air and ground work.

The army, then, can expect two kinds of cooperation from the air: reconnaissance and attack. Requests for reconnaissance can come from anywhere in the army organization. These requests go through the AGLS until they reach army, and finally from army to TAC for final approval and the orders for execution. Although requests for attack missions follow the same channels, the attack missions are of three types: the planned mission, the call mission, and the air-alert mission. Basically, the three missions are the same, the only difference being the elapsed time between the original request and the execution.

The planned mission is the simplest. The target is generally one that is suitable for attack at almost any time. A division, for instance, learns of the existence of an enemy supply dump. The request for air attack is forwarded on the afternoon prior to the desired time of attack. If corps approves, it goes to army where it is consolidated with requests from all other divisions and corps of the army, then passed to TAC for final approval and issuance of attack orders. The unit designated to make the attack receives the order during the night, the air crew are briefed early the following day, and the mission executed at the designated time. This method is fairly simple; but if it were used exclusively, there would be no provision made for immediate attack on a threatening target whose existence has just been discovered.

The call mission partially answers this problem. A group of tanks is observed behind the enemy lines. Since the tanks are capable of hitting our forward positions in a matter of minutes, it is decided that air attack is the most effective means of destroying the threat. The request goes immedi-

ately from regiment (or from whoever first observes the threat) to the division AGLS to corps AGLS to army AGIC by the quickest means possible. At each level, approval is obtained from the G-3 concerned. (If any headquarters disapproves, the request stops there.) TAC receives the request from army, and orders an immediate attack by an air unit which has been held in reserve for just such an emergency, or by diverting an airborne flight from a less important mission. After a quick briefing at the air field, or in the air, the unit makes the attack. The time lapse is generally about two hours from target sighted to target attacked. Even this is sometimes too long, so a third method has been evolved.

The air-alert type of mission is the quickest of all, but it is also the most expensive, and will generally be used during critical periods, when our troops are in the attack, exploiting a breakthrough, or withdrawing. In its simplest form, the air-alert mission is one in which a flight of fighter-bombers reports in to the forward controller of a designated ground unit at specified times during the day, for use on any target the ground unit desires hit. The unit is usually a corps, and it in turn decides which of its divisions needs air attack the most. The corps forward controller simply tells the flight leader to report to the division controller, who briefs the pilots in the air. Using this system, a target can be hit within minutes after it has been discovered.

The decision as to which ground units shall receive the air-alert missions is made at the joint air-ground planning conference, held daily during the late afternoon or early evening at the army-TAC headquarters. The aircraft may be ordered to report directly to a division controller, or even to an armored combat command controller, if that division or combat command is playing an important part in the operation.

On any of these three types of missions, the flight leader reports in by VHF radio to the ground controller most directly concerned. In many cases, the Air-Ground Liaison Officer will arrange with the supporting artillery to smoke the target to aid the pilots in identification. The forward controller may give additional details to the attacking pilots if they have already been briefed on the target, and in the case of air alert missions, the forward controller will do the entire briefing. (The forward controller may locate himself and his VHF radio near the AGLS of the unit in an observation post from which he can observe air attack, or in a vehicle near the head of the column if the unit is armored or motorized.)

Quick results from visual reconnaissance missions can be obtained by similar means. In many cases, tactical-reconnaissance pilots are instructed to pass on, in the clear, by VHF radio, any important discoveries they make behind the enemy lines. Thus, if a reconnaissance pilot spots an enemy convoy on the road beyond the observation of the ground forces, he merely broadcasts the information which can be picked up by all forward controllers and passed to the ground headquarters where action can be taken if necessary.

Thus do the air and the ground work together as a team. The intelligence commander will make every possible use of the air, but he will not delude himself into thinking that the air is the solution to every problem. Nor will he think that air power can clear the way completely for the ground troops. It will not. Intelligently applied to the ground battle, very much as artillery is applied, air power is of inestimable help. It does not, however, lay down a carpet of primroses on which the ground fighter may walk to easy victory.

Logistical Support of British Operation in Burma in the Winter of 1944-1945

BRIGADIER GENERAL WALTER K. WILSON, JR.
Deputy Engineer in Chief, Southeast Asia Command

IN the summer of 1944, Lord Louis Mountbatten and his Southeast Asia Command staff was faced with a logistical problem. The operational situation was as follows: Burma was still in the hands of the Japs. In the north, Chinese-American forces under General Stilwell were fighting for Myitkyina, the outpost of civilization in Burma in the north. In the northeast, British-Indian troops of the 14th Army were clearing the remnants of an audacious Jap offensive from the fringe of India and the northeast corner of Burma.

Figure 1.—Loading at Kalewa.

The mission assigned required the reconquest of Burma. The normal approach to Burma is from the south, through Rangoon (Figure 2). All communications in Burma extend from Rangoon. Railroad lines run from Rangoon to the north up through the center of Burma to Mandalay and Myitkyina with a side line off toward China to Lashio. The main river communication also extends from Rangoon, utilizing the Irrawaddy up to Mandalay and Myitkyina. However, since means of amphibious operation to retake Burma from the south were not available, Southeast Asia Command was forced to plan the conquest from the north. Entering Burma from the north, the railroad lines could be reached at Myitkyina and Mandalay, but railroad lines without rolling stock are of little value. Early in the campaign, the principal rivers in Burma could be reached; the Chindwin at Kalewa and the Irrawaddy at Myitkyina, but again without powered craft these rivers furnished an unsatisfactory line of communications. Before the war, no roads connected Burma with India. American forces under General Stilwell were hacking the Ledo Road across mountains and through the jungles to Myitkyina, but by the summer of 1944, this road was still several hundred miles short of Myitkyina. On the west, British engineers had earlier improved the road from Manipur Road to Imphal and had then built an extension across the mountains to Tamu. But Tamu is over 300 miles from Mandalay and nothing but tracks connected the two.

Figure 3 shows the rudiments of the available railroad communication line. Calcutta, a teeming port, was the starting point for supplies, both for British and American forces. From Calcutta, supplies were moved by rail over a broad-gauge line for over 200 miles and then transferred to a narrow gauge for another movement of 388 miles to reach Manipur Road, including transfer across the Brahmaputra by a rail ferry. The U.S. supplies followed this same route, but continued past Manipur Road to Tinsukia and the Ledo area. In addition, the small port of Chittagong was connected by a narrow-gauge rail with Mani-

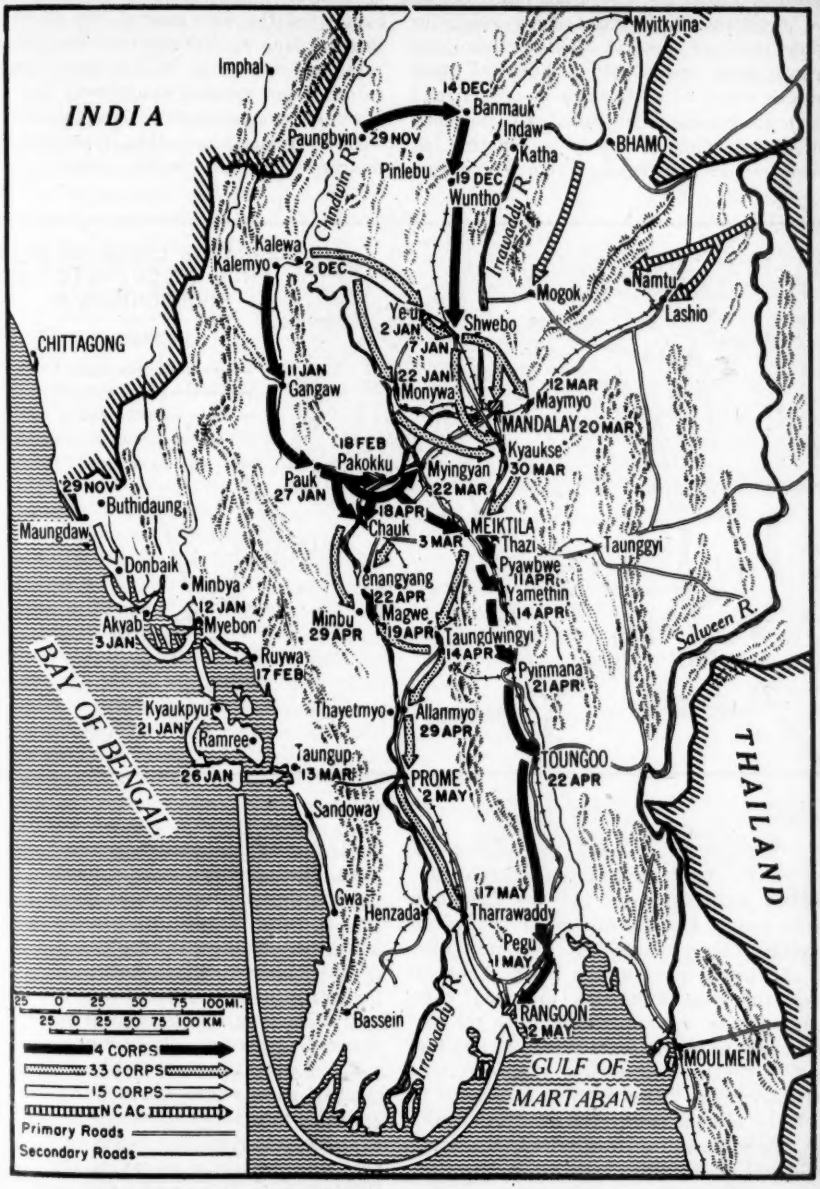


Figure 2.—Operations in Burma, 1 December 1944 to 17 May 1945.

pur Road, a distance of over 350 miles. Major base facilities at Calcutta were ready to handle the load, and at Manipur Road the advance base was in being. Forward from Manipur Road, an all-weather macadam road was in good shape to Imphal. Jap demolitions and monsoon damage had to be repaired between Imphal and Tamu. From Tamu forward, a fair-weather track ran to Kalewa. East of the Chindwin River lay a broad jungle-filled plain, traversed only by little-used tracks and a narrow fair-weather road to Mandalay. From Mandalay, the main road net of Burma leads to the south. Thus, in effect, the base area was prepared, even though supply was inflexible due to the distances and transshipments required. But forward of the base an almost virgin country must be crossed by an army of two corps to reach the central plain of Burma. And even then, once Mandalay was seized, the army would still be 400 miles from its goal at Rangoon.

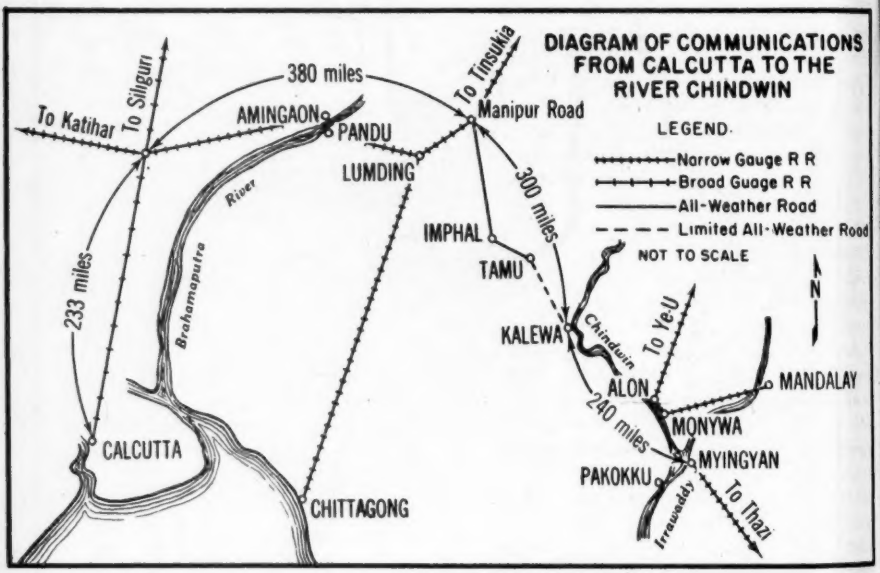


Figure 3.

Aside from the war against the Jap must be considered the war against the weather. In Burma, May to November is the season of rains or monsoons. While these torrential rains do not prevent operations, they break down all communication lines, making fair-weather roads impassable, interrupting all-weather roads for varying periods, and generally forcing operations to proceed at a walk. Thus, the operation must jump off in full force in December and reach its goal in Rangoon in early May in order to insure defeating the second enemy, the weather.

This completes the statement of the problem facing the Southeast Asia Command logistical staff. The progress of tactical operations is shown diagrammatically in Figure 1.

The logistical solution presented can be summed up in a few words: Use every means available to beat the monsoon. The successful efforts by the American forces to supply Chinese and American troops of the Northern Combat Area Command have been so well

covered by other articles that I will cover only the logistical support of the British 14th Army. One of the principal requirements was POL (gasoline and its allied products). A British pipeline was built from Chittagong to Manipur Road and then extended to Imphal. The road to Tamu was repaired to all-weather classification across the mountain region. One hundred miles of new all-weather road were built from Tamu to Kalewa. Because of the time element, lack of a sufficiently large number of dump trucks, and lack of good stone sources, this road was surfaced with PBS. PBS, directly translated, means prefabricated bituminized surfacing, or, as we would be more apt to know it, heavy burlap thoroughly impregnated with bitumen, brought up in rolls and laid on the prepared subgrade. This was definitely in the nature of an experiment, but it had to work, and be ready by the next wet season. In the meantime, traffic used the old dry-weather trail. Because there were not enough engineers to do this job and also bring the Kalewa-Mandalay road up to specifications, supplies forward of Kalewa would move by the Chindwin River down to the junction of the Irrawaddy to Myingyan. Only tactical vehicles belonging to divisions used the existing fair-weather road from Kalewa forward. To implement this river supply scheme, it was necessary to get floating equipment to Kalewa. The lines of communications would not handle the large tonnages of craft in addition to the essential tonnages to supply the army, so impromptu boat yards were set up at Kalewa and hundreds of various types of barges and boats were built. Engines and special fittings were brought down the long railroad and road lines of communications to complete the job, and even a few sectional tugs made the long journey. In addition to new craft built, every type of local craft available was pressed into service. POL was moved forward by making up large rafts of drums, fastening them together with a bamboo floor, and towing them down the river. Rafts for dry stores were constructed from light materials obtainable locally, principally bamboo, and floated one-way to Myingyan.

Figure 4.—Craft construction, Kalewa.

All of this would have been to no avail without the magnificent effort of the RAF and USAAF on air supply. It can be safely said that the Burma campaign was an air supply war. Divisions would advance fifty to a hundred miles, forward engineers would knock out an air strip, and the C-47's and 46's would land, thereby increasing the efficiency of payload over that possible by air dropping. Thus, in effect, the supply was by a series of hops

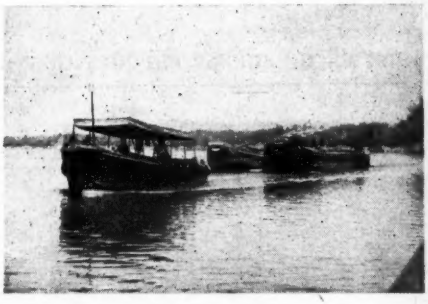


Figure 5.—Tow.

forward to one transport strip after another with the interval covered by air dropping. The flexibility furnished by this air supply enabled operations to outflank the Japs which would have been entirely impracticable by any other means. When the operations had succeeded in clearing portions of the railroad in the central plain, locomotives were brought forward by road and river, and some were even flown in by air.

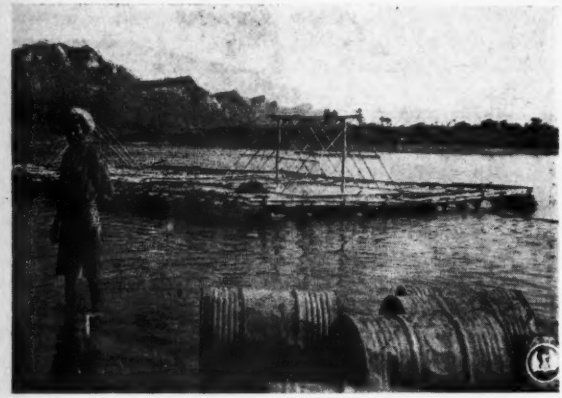


Figure 6.—POL raft; drums with bamboo deck.

The tables on pages 16 and 17 show in statistics what was involved in this tremendous logistical task, but they cannot give the true measure of the hardships and difficulties involved. The operation was a success because the fighting troops were willing to get along without supplies normally considered essential; because when an emergency arose, air supply was able to deliver the goods on time; because thousands of troops and labor working on the often crude and elongated lines of communications kept tonnages rolling forward through every difficulty.

This solution to a difficult logistical problem is not one which others will try to follow in the future, but it is a prime example of the advantages of control of the air, of adequate air supply, and of combined efforts by every practical means to deliver sufficient supplies to the right place in time to support tactical operations. Both the British and American troops who participated can be proud of a task well done.

TABLE A.—AIR SUPPLY SUPPORT OF FOURTEENTH ARMY AND 15 CORPS IN BURMA

Month	*Squadrons Available*	*Sorties Flown*	PAYLOAD FLOWN FORWARD ONLY					
			Men Number	*Stores (Short Tons)*	*Estimated Total Weight*	*Dropped Free*	*Para-chuted*	*Landed*
1944								
July	12	2,262	6,544	5,696	6,351	12%	15%	71%
Aug.	4	872	4,248	1,632	2,056	25%	29%	46%
Sept.	6	952	1,759	2,645	2,821	29%	52%	19%
Oct.	8	1,656	6,603	4,422	5,082	10%	57%	23%
Nov.	10	3,674	636	11,176	11,239	27%	56%	17%
Dec.	14	5,958	4,163	19,633	20,049	17%	34%	49%
1945								
Jan.	13	9,826	10,804	35,032	36,113	10%	21%	69%
Feb.	15	13,936	17,983	45,877	47,675	7%	13%	80%
Mar.	18	16,537	20,193	58,631	60,651	3%	12%	85%
Apr.*		16,800	30,500	61,200	64,250	2%	10%	88%
May*		14,700	16,500	53,500	55,150	5%	15%	80%

*April and May figures are approximate.

COMMAND AND GENERAL STAFF SCHOOL

MILITARY REVIEW

FORT LEAVENWORTH, KANSAS

SUBSCRIPTION NOTICE

IN ENGLISH . . . This issue of the MILITARY REVIEW contains subscription forms for all three editions. On the reverse side of this sheet may be found a form for subscription to the English language edition; the other half of this sheet, in the back part of the magazine, contains a subscription form for the Brazilian edition on one side and for the Spanish-American edition on the other.

AVISO DE SUBSCRIPCION

EN ESPAÑOL . . . Este número de la MILITARY REVIEW contiene blancos de subscripción para las tres ediciones. Al dorso se encuentra un blanco de subscripción para la edición en inglés; en la parte de atrás de la revista, en la otra mitad de esta hoja, se encuentran blancos de subscripción para la edición brasileña en un lado y, al dorso, para la edición hispanoamericana.

AVISO DE ASSINATURA

EM PORTUGUÊS . . . Êste número da MILITARY REVIEW contem fórmulas de assinatura para as três edições. No verso encontra-se uma fórmula de assinatura para a edição em inglês; na parte posterior da revista, na outra metade desta folha, encontra-se uma fórmula de assinatura para a edição brasileira num lado e para a edição hispano-americana no outro.

Command and General Staff School, Fort Leavenworth, Kansas

MILITARY REVIEW

English Edition

☐ Please enter my subscription to the MILITARY REVIEW for ____ year(s). Enclosed is $3.00 for each year. I am not now a subscriber.

☐ Please renew my MILITARY REVIEW subscription, which expired recently, for ____ year(s).

☐ Please extend my present MILITARY REVIEW subscription for ____ year(s). Enclosed is $3.00 for each year.

In order that your copies of the MILITARY REVIEW may always reach you as quickly as possible, please forward any change of address and include

1. Your name and rank
2. Your new address
3. Your old address

Name ----------

Address ----------

Mail this form and remittance to

MILITARY REVIEW

Command and General Staff School, Fort Leavenworth, Kansas

TABLE B.—INLAND WATER TRANSPORT DISPATCHES—CHINDWIN RIVER

Month 1945	KALEWA to MYINGYAN			KALEWA to ALON			ALON to MYINGYAN		
	Stores (short tons)	Personnel (number)	Motor Transport (number)	Stores	Personnel	Motor Transport	Stores	Personnel	Motor Transport
March	5,815	1,252	21	27	9	.....	635	4	.....
April	11,924	1,332	71	421	56	.....	3.534	451	2
May	20,280	2,438	28	717	432	2	2.068	573	.....

NOTES: In addition, average of 10,000 tons/month POL floated in drums in March, April, and May.

STANDARD TOWS — AVERAGE TURNAROUND = 12 days

(a) 1 Unicraft SS Tug and 2 Unicraft Barges — 78-ton payload.

(b) 1 Unicraft TS Tug and 4 Unicraft Barges — 156-ton payload.

(c) 1 R.C.L. towing 2 Higgins Barges — 140-ton payload.

SUPPLEMENTARY LIFT

(a) E.A. Boat Rafts—British Military Class 30

(b) Native bamboo and POL Drum Rafts

(c) Salvaged Craft

TABLE C.—I. W. T. CRAFT CONSTRUCTION AT KALEWA

Month 1945	Number of Main Types of Craft Built						Number of Supplementary Craft Built				
	Unicraft Tug SS	Unicraft Tug TS	Unicraft Barge	Higgins Barge	Ramped Cargo Lighter	Total Tons Capacity	Burley Boat	G.P. Launch	Rodda Craft	E.A. Boat	Swamp Glider
Jan.	5	.....	5	.....	2	251	9	5	2	.....	.....
Feb.	7	.....	12	3	4	748	14	5	8	84	.....
Mar.	15	.....	16	18	7	1,828	25	19	4	156	.....
Apr.	18	8	57	34	7	4,323	.....	.....	2	220	.....
May	5	8	38	24	14	3,218	.....	2	.....	172	2
Total No.	50	16	128	79	34	10,368	48	31	16	632	2

TABLE D.—CHITTAGONG-TAMU PIPELINE

From	To	Miles	Diam. Pipe	Date Started Operation	Monthly Throughput in Millions of U.S. Gallons	
					Designed	Actual
Chittagong	Akhaura	125	4"	31–12–44	7.2	6.6
Akhaura	Kulaura	82	4"	15– 1–45	7.2	6.6
Kulaura	Chandranathpur	62	4"	9– 2–45	6.0	5.4
Chandranathpur	Manipur Road	134	4"	1– 3–44	5.4	4.2
Manipur Road	Imphal	132	4"	1– 3–45	4.8	3.6
Imphal	Tamu	78	4"	21– 5–45	4.8	3.0
		613				

Summary of P.O.L. Carriage Beyond TAMU Pipehead:

1. Tamu to Kalewa —In barrels (53 gallon) or by road tank truck (960 gallon capacity)
2. Kalewa to Myingyan —Bulk barges not available. Barreled and floated down CHINDWIN River in rafts of 80 drums Some bulk transferred to small boats and barges fitted with portable tanks.
3. Ex Myingyan —By road tank trucks and rail tank cars, also some returned containers. Ultimate capacity 3 to 3.6 million gallons per month.

TABLE E.

Road Dispatches ex. Manipur Road (Railhead)

Month 1945	Stores (short tons)	P.O.L. (short tons)	Personnel (number)	Motor Transport (number)
Feb.	49,280	28,056	21,875	1,000
Mar.	45,777	23,584	42,202	6,008
Apr.	34,189	18,771	23,401	1,235
May	27,423	8,692	14,798	354

Rail Dispatches ex. Myingyan (to Meiktila and Thazi)

Month 1945	Stores (short tons)	P.O.L. (short tons)	Personnel (number)
26–30 Apr.*	444	223	145
May	3,095	2,370	376

*Jeep "Trains" started operating early in April, with a capacity of about 170 tons per day.

Royal Engineers in Combat

By one of them.

THE basic organization and functions of the RE [Royal Engineers] are very similar to those of the Corps of Engineers. This similarity greatly facilitated cooperation where the two corps fought in an Allied army as in Italy. There are, however, a number of minor points of difference which provide food for thought.

Let us first consider the engineers of the British infantry division, which consist of three field companies and one field park company, the whole being commanded by a lieutenant colonel known as Commander Royal Engineers (CRE). This officer is a man of some account among all branches, and there are few activities in the division in which he plays no part.

The companies of division engineers are *not* organized on a battalion basis. They are commanded by majors, with a captain 2 i/c [second in command], three lieutenants as platoon commanders, two spare lieutenants for reconnaissance and odd jobs, and 240 enlisted men.

This company system originates from the peacetime role of the British Army, which was spread in small packets all over the Empire, for police work, "small wars," and garrison duty. The field company organization has, however, stood the test of two major wars.

It is impossible to plan and organize any engineer work without a preliminary reconnaissance. For this reason, the field company is provided with two lieutenants who have no platoon.

Any of these officers may be sent with the division reconnaissance regiment for general route reconnaissance; or sent on a specific mission. Engineer reconnaissance is a subject which is most difficult to teach, but in a well-trained division information will flow in to the CRE from all sorts of sources—infantry patrols, armored cars, artillery observers, and so on.

When specific detailed engineer information is required, for example on minefields or rivers overlooked by the enemy, it has been found best to use small RE patrols operating by stealth, rather than strong fighting patrols, whether all engineer or mixed infantry/engineers.

The equipment of division engineers is remarkably similar in the two Armies. The RE have no automatics heavier than the Bren. The mechanical equipment, bulldozers and graders, is all carried by the field park company, to be allotted by the CRE as required.

Functions of Infantry Division Engineers

The functions of division engineers are much the same in both armies. Briefly they are:

a. Bridging and rafting. In the British Army, assault boats are controlled, manned, and rowed by the infantry, the RE providing only advice or assistance in fast currents. This enables the RE to concentrate on the more skilled work of getting vehicles and guns across. Otherwise the technique is similar in both armies.

b. Minefield breaching. Both U.S. and British Armies, therefore, now teach and equip units of all arms to clear the incidental mines from their path, but call on the engineers for the deliberate breaching of formal minefields.

c. Demolitions. There has been a tendency recently for other arms to use explosives for various purposes; but major demolitions in a withdrawal are likely to remain a purely engineer commitment, because of the chaos which would occur if units were blowing key bridges to suit themselves. Such demolitions must be controlled by the staff, and in the British Army much emphasis is given to the following points in training:

First, the commander must give ample notice of his intention to his engineer, so that the necessary reconnaissance can be made and the stores and men distributed over roads which in a retreat will inevitably be congested.

Second, the commander must lay down in writing the name or appointment of the officer responsible for ordering the firing of demolitions on routes of withdrawal.

It is extraordinary how few cases are known to history where a complete belt of demolitions has been successfully executed in the face of an advancing enemy. So perhaps the most useful of the innumerable Pro Forms issued to the British Army is the one given to the RE officer or noncommissioned officer in charge of a prepared demolition. It tells him who will give orders to fire, and what he must do if there is danger of the enemy capturing the bridge intact in the absence of the specified officer. It is the business of the staff to prepare and issue the order, and the responsibility of the CRE to see that it is issued. It is also a very useful reminder to all concerned on the vital necessity for close control of the withdrawal if an effective obstacle is to be created without sacrifice of our own troops cut off on the far side.

d. Minefields. All arms are trained to lay hasty minefields, also deliberate antitank minefields, but only under RE supervision; the RE are responsible for recording the minefields, which are laid only on the orders of the division commander or some officer designated by him. This officer is usually the best qualified to coordinate the antitank defense on the division front, and to tie up artillery fire, natural obstacles, and minefields.

Antipersonnel mines are only laid on orders of division commander, and are entirely an engineer responsibility.

e. Field defenses. All arms are responsible for the construction of their own defense works, with the advice and assistance of the RE where required.

f. Tracks and roads. Division engineers are responsible for maintaining the mobility of their division, but are neither trained nor equipped to construct highways. Except under static conditions, they are unlikely to be able to do more than construct temporary bypasses or bridge approaches, and make hasty repairs.

g. Water supply. The usual equipment for provision of temporary waterpoints is carried in the field park company.

h. Engineer stores. For items used by all arms, such as barbed wire, picks, and shovels, the general staff allots supplies to units. This he does through his field park company.

i. Construction work. Though not designed for it, field companies are frequently called upon to carry out permanent works on the line of communications.

It should be noted that there are various duties of the U.S. divisional engineers which are not carried out by their British counterpart. These are rowing assault boats, unit camouflage, terrain appreciations for the division commander, flame-throwing operations, and map supply. Maps are prepared by survey companies RE operating under the general staff at army headquarters.

It is laid down that field companies will always be employed under command of the CRE, however dispersed they may be for work and movement, unless there are very good reasons for putting companies under command of a brigade. There is often a tendency among inexperienced staffs to attach them here and there in small packets, simply because they cannot foresee any one concentrated job for them.

Of course conditions may arise where elements of a division are so scattered that it is necessary to put companies or platoons of engineers under command of brigades or battalions of infantry.

The use of RE as infantry is also discouraged on the grounds that their job is quite dangerous enough anyway and it is a waste of skilled men. They are trained to defend themselves, to go on patrol, and to carry out assault mine lifting and demolitions in cooperation with infantry or tanks, but are not trained to attack as infantry. They are trained to occupy a defensive position, but are only so used in emergency, such as occurred in Tunisia where some field companies held a part of the line for several weeks.

The CRE, with his small operational and

intelligence staff, lives with main division headquarters. He or his adjutant can always be found there, and his office, etc., vehicles move as part of division headquarters.

He is the executive commander of his own companies, plus any additional units of corps engineers which may be attached to the division for a special operation. He is thus the sole engineer adviser of his division commander at all times, and a full member of his planning team. He has direct access to the commanding general on all technical matters. He is not solely a technician, but an essential cog in the divisional machine, just as the artilleryman is an essential cog.

The CRE must be kept fully informed of the progress of the battle and of his commander's intentions, or his efforts will be too little and too late. He can never expect a perfect staff to supply him with a perfect flow of information. He must get around and see things for himself, and train his staff to do likewise, particularly his intelligence officer, who must flit like a bee collecting honey from the other branches, never sitting like a spider waiting for the passing fly.

The fact that the field companies are independent of a centralized battalion administration greatly facilitates cooperation between the CRE and the other branches of the staff and services at division headquarters. His own staff is small; in training, on shipboard, and in the field, they live and work at division headquarters, and are thus members of a family who understand each other's capabilities, problems, and idiosyncrasies. Without such understanding, cooperation can be nothing but a theory.

Similarly the field company will normally live, move, and train with one of the infantry brigades, and will get to know the members of their team in the same way.

Armored Division Engineer

Its engineer component is still organized in squadrons, two field squadrons and one field park squadron.

The functions of the engineers of the armored division are the same as those of the infantry division, with special emphasis on maintaining the mobility of the division.

Assault Engineers

These are new units specially raised to overcome the obstacles on the Normandy coast, where they were a great success. They are fully armored, the basic vehicle being the Assault Vehicle RE (AVRE), a Churchill tank without the primary armament, which is replaced by a petard. The petard is a spigot mortar firing a special charge for the destruction of concrete obstacles or pillboxes. They are also capable of operating a number of alternative devices for breaching heavily fortified zones without the crew dismounting; for example, concrete walls, Element C, antitank ditches. As such zones are always in considerable depth, they are organized in troops of AVRE, so that a troop may be given one complete route to clear. They are highly specialized units, and must be carefully rehearsed in cooperation with the other arms, which will almost invariably include artillery, support tanks, and flail tanks, and also very often infantry. The flail tanks are manned by the Royal Armored Corps.

Airborne Engineers

Airborne divisions have their usual complement of engineers, specially equipped either for parachute dropping or for carriage in gliders or transports. Their role is the immediate support of their division, and is likely to include demolitions and mine-laying to consolidate the objective, and the preparation of glider strips.

Corps of Engineers

There is a chief engineer (brigadier) on the staff of the corps commander as technical adviser. Corps troops consist of a colonel as Commander Corps RE (CCRE), and a variable number of units depending on the theater. The organization of corps troops is at the moment complicated. The numbers have recently been doubled; hitherto the only permanent allotment was one CRE and four companies, which were inadequate.

The British divisional engineers are numerically rather stronger and more mobile than those of the U.S. Army. On the other hand, the U.S. corps troops are stronger so that a higher proportion of engineers in the corps are under centralized control. The British still retain their company organization in division, corps, and most army troops. We do less for other arms and expect them to take care of themselves in all matters which have ceased to be novelties. We emphasize very strongly that the field engineer is an essential member of the fighting team and *not* merely a technician who trades in black magic and who can be whistled up when required.

Bomb Disposal Work

From *Army Ordnance* September-October 1945.

THE Bomb Disposal Division of the Ordnance Section, European Theater of Operations, has been scratched from the top-secret list.

Bomb disposal, as distinguished from removal of booby traps and land mines, which is the mission of the Corps of Engineers, can be defined as a task requiring expert recognition and neutralization of all types of bombs, shells, and explosives.

Since the beginning of the invasion of the Continent, the research and development section of the Bomb Disposal Division has refined methods of bomb deactivation to such an extent that a forty-pound kit contains all the instructions now necessary for a task which once required a five-ton truckload of materials. Methods which are still not for publication have simplified the neutralization of dangerous explosives to such an extent that "Anything we can dig down to and uncover without exploding we can carry away in safety."

After D-day, when four squads of bomb-disposal officers and men went to work on the beaches of Normandy clearing away unexploded artillery shells, rockets, German parachute mines, and long-range time bombs, BD Division personnel removed on the average of 3½ tons of munitions and unexploded bombs a man each month. About 1,600 tons of bombs and explosives were removed from the Paris area alone shortly after the occupation.

The high rate of casualties among BD men is not due primarily to the exploding of bombs on which they work. Artillery fire, snipers, and machine guns account for most of the casualties. Often BD men, who are not listed as combat troops, go out into the battlefield ahead of the infantry to "delouse" the area.

A BD man had to be able to recognize and deactivate between 200 and 300 types of German fuzes including many kinds of artillery fuzes. The first unexploded buzz bomb in England underwent careful examination by BD experts who say, without boasting, that they can safely handle any fuze they have come across thus far.

East Central Luzon Guerrilla

COLONEL A. N. BAUTISTA, *Philippine Army*

The author was Military District Engineer, Northern Luzon, in 1936 and 1937. From 1937 until 1940 he was Executive Officer, Headquarters Corps of Engineers, Headquarters, Philippine Army, and Chief of Constructions and Operations. During the period from 1 January until 27 November of 1941, Colonel Bautista was an instructor, Department of Tactics, Philippine Military Academy. He was assigned as Commanding Officer, 11th Engineers, 11th Division, after leaving the Academy faculty, and remained in that capacity until 9 April 1942, having been continuously in action against the Japanese from the invasion of the islands until that date. Continuing thereafter to fight the Japanese as one of the Guerrilla personnel, Colonel Bautista was appointed Assistant Chief of Staff, G-2, General Headquarters, ECLGA (East Central Luzon Guerrilla Area), in April of 1944 and Chief of Staff in October of that year. During the early months of 1945 he was again in combat with the Japanese, planning and directing mopping-up operations in the Obando-Meycauayan-Polo area in the Philippines. Shortly thereafter, he attended the Command and General Staff School, Fort Leavenworth, Kansas, from which he was graduated with the Twenty-fourth Class.—THE EDITOR.

FEATURED articles, magazine stories, and the screen have portrayed the guerrilla activities in the Philippines, but failed to depict accurately their organization and operations, especially with reference to the Luzon Guerrilla Forces which consisted of various recognized and nonrecognized units. This article deals with the East Central Luzon Guerrillas, who operated mainly inside and around Manila.

Organization

Long before the final fall of Bataan, scattered elements of USAFFE [United States Army Forces in the Far East] cut off from their units in Northern Luzon banded together and started guerrilla warfare with the support of patriotic civilians. In January 1942 Lieutenant Colonel Nakar and several other Filipino officers were already operating north of Pangasinan (Figure 1), along with various other scattered groups led either by an American or a Filipino. In February 1942, General MacArthur sent Lieutenant Colonel Thorpe, 26th Cavalry, PS [Philippine Scouts], from Bataan through enemy lines, charged with the mission of coordinating, integrating, organizing, and intensifying guerrilla activities. Traveling through the mountains, Colonel Thorpe's small party arrived in the area of Mt. Pinatubo (behind the enemy's main line) in the latter part of March 1942. Early in April 1942, a second party reached Colonel Thorpe's camp, sent out of Bataan by boat to establish radio communications with Colonel Thorpe and to engage in an intelligence mission. Upon the fall of Bataan, several other American and Filipino officers who escaped capture by the Japanese joined Colonel Thorpe who then drew up the general plans and policies for organizing the USAFFE Luzon Guerrilla Army Forces. Armed with the authority granted him by General MacArthur, Colonel Thorpe appointed and inducted additional guerrillas, issued General and Special Orders which subdivided Luzon into four areas, and initially assigned commanders as follows:

1. Northern Luzon Guerrilla Area, comprising all the provinces north of Nueva Ecija, Tayabas, and Pangasinan, under Major Ralph Praeger, 26th Cavalry, PS (he was captured subsequently by the enemy in September 1943 and Major Volckman, 11th Division, inherited the command, including the units organized separately by Lieutenant Colonels Moses and Noble who were also captured by the enemy).

2. West Central Luzon Guerrilla Area, comprising the province of Zambales under Captain Maguire, Corps of Engineers.

3. Southern Luzon Guerrilla Area, comprising the provinces south of Manila un-

der Captain Jack Spies, 26th Cavalry, PS, who was killed while en route to his assignment.

4. East Central Luzon Guerrilla Area (ECLGA), comprising the provinces of Pangasinan, Nueva Ecija, Tarlac, Pampanga, Bulacan, Bataan, and all of Manila and suburbs. Captain Joseph Barker II, 26th Cavalry, PS (executive officer of Colonel Thorpe), was ordered to organize and command the East Central Luzon Guerrilla Area including Manila.

The staff of ECLGA then consisted of:

Captain J. Barker II, 26th Cavalry, Commanding Officer.

First Lieutenant E. P. Ramsey, 26th Cavalry, Adjutant.

First Lieutenant R. B. Lapham, Inspector General of Pangasinan and Nueva Ecija.

Captain B. L. Anderson (who reported later in June 1942), Commander of Bulacan.

Shortly after assuming command of ECLGA, Captain Barker unsuccessfully attempted to contact Colonel Straughn, USA, retired, who was leading an independent unit in Laguna, south of Manila. Captain Barker, disguised as a priest, would go in and out of Manila while conferring with Filipino supporters and guerrilla leaders. He was finally captured by the Japanese on 11 January 1943 and was forthwith succeeded by his Adjutant, then 1st Lieutenant E. P. Ramsey, who proceeded to carry on the work of organizing and consolidating guerrilla units in the area and appointed officers to replace those captured with Captain Barker. On or about March 1943, Lieutenant Ramsey was informed of his promotion to Major via the Northern Luzon Area radio set, then operated by Major Praeger.

In accordance with the plan laid out by Colonel Thorpe, the Luzon guerrillas were recruited in the following manner:

1. Each province in the four main areas into which Luzon was subdivided was organized as a military district with a commander duly selected and appointed by Colonel Thorpe and/or the area commander. The district commander selected and appointed his staff (organized along divisional staff sections) and the regimental commanders; the latter similarly organized his regimental staff and appointed battalion commanders; and thus the selection and induction of officers was made down to platoon leaders who in turn picked their own sergeants and squad leaders. The squad leader was the man who really recruited the privates for his squad. Consequently, members of the squad did not know one another and knew only the squad leader; the latter knew only the platoon sergeant and his lieutenant; the platoon leader knew only the captain, and so on to higher command.

Figure 1.

2. Except those actively on duty with district G-2 and regimental and battalion S-2

sections, all guerrillas remained in their homes and kept their normal occupations, but received secret instructions and circulars from higher headquarters.

3. Unit commanders, down to squad leaders, devised ways and means to check on the loyalty, determination, and courage of the prospective guerrilla members.

4. All guerrilla members worked gratuitously and were not allowed to bring their families with them when on active duty with their unit.

5. Appointments and promotions of officers and men were subject to confirmation by the area commander.

6. District court-martials, patterned after the USA court-martial, tried and sentenced military offenders.

7. Pseudonyms were assumed by every guerrilla for further security. Directed and guided by a staff of experienced USA and USAFFE officers, the ECLGA had a total strength of 28,400, of which 21,000 were recognized, paid, and equipped by USAFFE (now AFPAC) [Army Forces in the Pacific], and attached for combat operations as follows:

Sixth Army:	I Corps—8,000
	XIV Corps—6,000
	XI Corps—5,000
Signal Base Depot	—2,500

Operations

Before the liberation of Luzon, the main mission was intelligence. Organization of combat units was conducted secretly and the regiments were inactive. A training school for officers was conducted in each district headquarters for highly selected guerrilla officers who had no military background but had demonstrated leadership and loyalty to the cause. The Manila District school was located at not more than fifteen miles from the heart of the city of Manila and within a few miles from a Jap garrison in the hills of Novaliches, Rizal. Most of the instructors were graduates of the Philippine Military Academy, and consequently guerrilla student officers underwent a hazing and toughening process continuously while absorbing training in minor tactics and technique of infantry, sabotage, intelligence, and counterintelligence.

Equipment, supplies, and funds for operations previous to the landing of American Forces of Liberation were obtained mainly through voluntary subscriptions by the people. This was supplemented by raiding Jap depots, warehouses, truck convoys, and trains —the usual source of firearms and ammunition for Luzon guerrillas. It was operationally impossible to receive arms and equipment from Southwest Pacific Area (SWPA) until after the liberation of Pangasinan.

Intelligence Activities.—The Intelligence Unit of ECLGA, organized as indicated in the accompanying chart (Figure 2), was centrally controlled and coordinated. District G-2 and regimental and battalion S-2 sections operated in their territories. Agencies operating directly under ECLGA G-2 provided means for counterchecking, sifting, collating, and evaluating information of immediate operational importance, such as enemy identifications and land, air, and sea movements; furnished data essential to long-range strategic planning; and counterintelligence. The intelligence network, spread out in Manila, Pangasinan, Tarlac, Nueva Ecija, Bataan, Bulacan, Pampanga, Rizal, and Cavite, supplied vital information on the enemy's installations, concentrations, strength and dispositions, location of airfields, dispersal area, depots, factories, axis of communication, identifications of units, movements on land, air, and sea, tactics, and order of battle. Coverage was for twenty-four hours, operatives working in pairs. Information was transmitted to area headquarters within twenty-four hours by couriers and/or radio. Area G-2 collated and evaluated all the information and decided which was to be transmitted to General Headquarters, SWPA, over the radio. Periodic reports, together with captured enemy documents, maps, and sketches, were dispatched by couriers who hitch-hiked to Batangas or Tayabas Bay to catch sailboats for Mindanao and Panay, where copies of the reports were

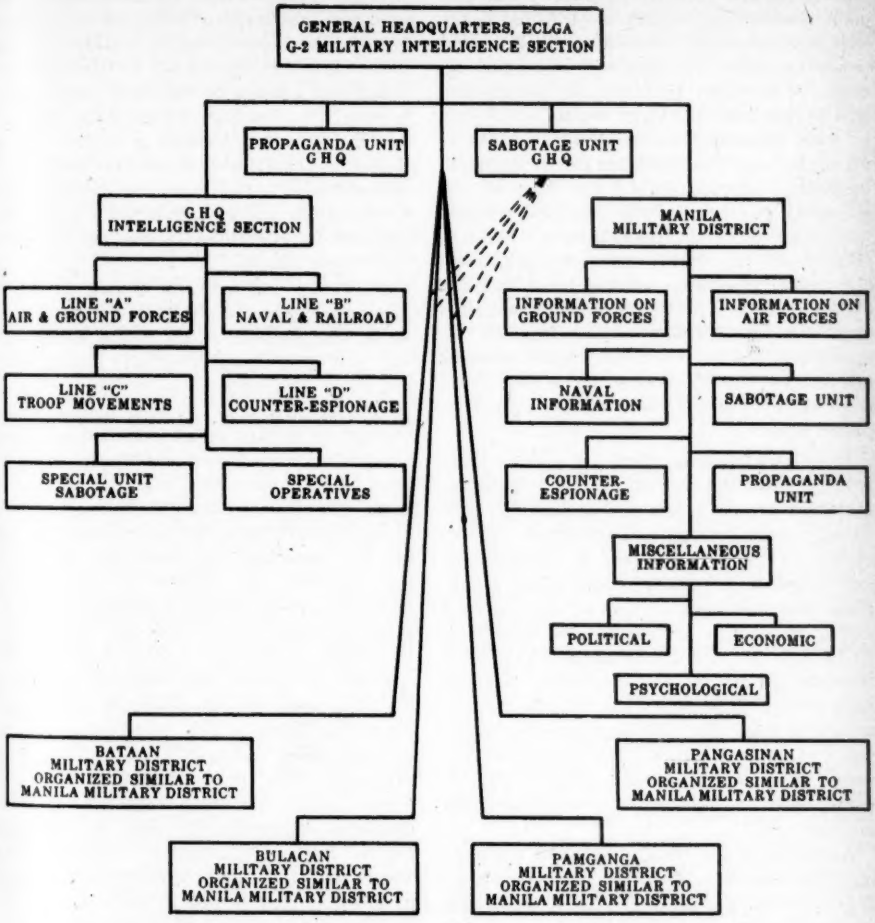


Figure 2.

delivered to Colonels Fertig and Peralta, respectively, for transmission to SWPA. Close liaison was maintained with other guerrilla units in Luzon and Visayas. However, since October 1944, when area G-2 established contact with Lieutenant Commander George Rowe, USNR, Commanding the SWPA Advance Detachment that landed by submarine in Mindoro in July 1944, all periodic reports and enemy documents and matériel, as well as USA pilots who were shot down and recovered in ECLGA, were sent to Mindoro.

The main radio station and General Headquarters, ECLGA, were installed on Mt. Balagbag, overlooking Manila Bay, San Mateo, Novaliches, Montalban, and Ipo (towns surrounding Manila). Aircraft warning and naval sighting stations were maintained and operated here with the aid of a telescope.

Movements of vessels in Manila Bay, and pinpoint observations on effects of Allied bombings were instantly radioed to SWPA. Less powerful radio sets operated at mobile advance observation posts in Novaliches and San Mateo and in district headquarters tied in with General Headquarters, ECLGA, at Mt. Balagbag. The Mountain Corps Regiment furnished security around the base of Mt. Balagbag and handled the logistical requirements of General Headquarters, ECLGA. Gasoline for the battery chargers was sneaked out weekly from a sealed warehouse guarded by a Jap sentry in Montalban in five-gallon tins. One guerrilla squirmed through an opening at the rear and the Japanese never noticed that the drums of gasoline were being emptied by rubber hose siphon into five-gallon tins.

It is interesting to point out at this juncture that Montalban, San Mateo, Novaliches, Marikina (towns below and around Mt. Balagbag) were strongly garrisoned by the enemy. It was quite a feat to smuggle not only gasoline but much needed Class I supplies past the thick cordon of sentries and roving patrols up to General Headquarters, ECLGA. Night and day vigilance was kept at strategic points by the guerrillas, but the Japs finally determined the location of the station in December 1944 only upon the breakdown of several civilians and guerrillas arrested in various raids on our advance command posts in San Mateo, Novaliches, and Manila.

Attempts by the enemy to assault the General Headquarters, ECLGA, from December 1944 to January 1945, employing 500 infantry, military police, and blood-hounds, were repulsed. Two reconditioned caliber .50 machine guns salvaged from the Gruman Fighter of Ensign Woods (who was shot down in that vicinity in October 1944) were mounted on top of a commanding hill covering the avenues of approach. Time and again the Japs suffered casualties in attempting to raid General Headquarters. Even after they had placed a strong cordon around us, arrested and tortured civilians found in the area, burned houses, and abused women suspected of guerrilla activities, we were able to dismantle and transfer the station, including all records, down to the Leprosarium in Novaliches in the latter part of January 1945. The Leprosarium, which was avoided by the Japs, was a haven to guerrillas. The lepers were really not there any more, having escaped or moved to other houses in the vicinity. Guerrillas wounded in skirmishes with the Japs were treated at the Leprosarium where one concrete building was reserved for guerrillas. In fact, the employees were guerrillas too.

Particular attention is drawn to intelligence operations in Manila and suburbs right under the vigilant watch of the Kempei-Tai and in a territory infested with enemy troops and spies. The largest counterintelligence net of the ECLGA also operated inside Manila. Operatives worked as laborers and employees in airfields, communication centers, supply depots, railroad terminals, shipping yards, Port Area, government offices, factories, and Japanese Military Administration offices, including Fort Santiago; rendered daily reports on their missions; took census of salient details of installations, seizing or duplicating secret maps and sketches; determined the enemy's intentions; traced his communication lines; studied his tactics and methods; evaluated his equipment; and at opportune times, sabotaged his installations and liquidated his counterintelligence agents. During the Leyte campaign, this net successfully identified enemy units, including high-ranking commanders, dispatched to Leyte as reinforcements. Daring intelligence agents rubbed elbows with the Japanese military police, and in this role they helped in the rescue of apprehended guerrillas and gave timely warning of possible raids on guerrilla headquarters by the enemy. Prior to the battle of Manila, when Japanese counterespionage activities reached threatening proportions, operatives laboring under extremely precarious and hazardous circumstances stuck to their assignments at the risk, and in many cases, the cost, of their lives, and turned in detailed and highly reliable information on the enemy's defense plans in Manila, supplemented by maps and sketches

of pillboxes and foxholes; street barricades; mined streets, bridges, and buildings; gun emplacements; troop strength, dispositions, and movements; and other tactical information. From September, 1944, when the first Allied air raid struck at Manila, the Manila Intelligence Unit played an enviable role in spotting enemy air defenses and maneuvers, plane dispersion areas, naval activities, troop billets, and potential military installations, contributing largely to the accurate bombing and the consequent destruction of military objectives in and around the city. Casualties among operatives were heavy and many were tortured to death by the Kempei-Tai, all in line of duty—also unhonored, unsung, and unpaid.

Sabotage Activities.—Directives issued by ECLGA Headquarters coordinated sporadic raids and sabotage activities, although seriously handicapped by lack of arms and materials. Sabotage machines were improvised and made in Mt. Balagbag from chemicals and local materials smuggled from Manila and slipped through the strict vigilance of the enemy. Intrepid saboteurs swam to enemy vessels anchored at Manila Bay on 16 June 1944 and managed to set afire a tanker loaded with gasoline. The fire spread out to a transport and cruiser anchored nearby. In Pampanga, Bataan, Bulacan, Rizal, Pangasinan, and Tarlac, enemy communication lines were tampered with, small patrols were ambushed, supply dumps were raided, bridges were burned, and rice stock and alcohol of the "BIBA" (the rice procurement agency of the Laurel puppet government) were diverted to guerrillas with the aid of USAFFE officers holding key positions in the "BIBA," as directed by ECLGA G-2, who held a ranking position there and directed operations from inside Manila with utmost secrecy until the Japs were informed of his real identity with ECLGA in July 1944. Arms were obtained by raiding enemy dumps or small garrisons and waylaying army trucks. On 25 July 1944 a steamship anchored at Pasig River, loaded with rice, crude oil, and other supplies, was set afire. On 15 July 1944 parts of Piers 5 and 7 were burned, as well as some *bodegas* of the National Development Company and the Philippine Refining Company.

Propaganda Activities.—These consisted of dissemination of news broadcasts from San Francisco and the "Voice of Freedom," posting wrappers from American-made chocolate bars with the words "I SHALL RETURN—MAC ARTHUR" and typewritten thereon "COMPLIMENTS FROM THE VOICE OF THE MISGUIDED ELEMENTS" on billboards, inside toilets of first-class theaters, and on street cars, busses, and other places on 20 June 1944. On or about 15 June 1944, a large sign was written in charcoal on a bulletin board inside Fort Santiago, reading "WARNING—THE AMERICANS ARE COMING."

Combat Activities.—Immediately upon the return of area G-2 from a Mindoro rendezvous with Lieutenant Commander Rowe in October 1944, warning orders were issued to all inactive units of ECLGA outlining detailed operations on D-day, to be synchronized with SWPA landing operations in Luzon. Thus ECLGA combat elements entered the picture on the day Sixth Army landed in Pangasinan. ECLGA units in Pangasinan, Tarlac, Nueva Ecija, Bataan, and Pampanga readily reported to beachheads and assisted actively in combat operations of Sixth Army. We were engaged with the enemy in Meycauayan, Bulacan (where General Headquarters, ECLGA, was established) three days before the 37th Division advance guard reached that town. Bypassed enemy pockets of resistance, especially in Bulacan, Rizal, and Manila, were mopped up by ECLGA troops. Generals Krueger and Kenney selected trained "Ranger" units of ECLGA for their bodyguard troops.

The enemy's rear is there to play hell with.
—General Sherman

Development of a Fire Support Plan for an Amphibious Operation

LIEUTENANT COLONEL CHARLES W. THOMAS, *Infantry*
Instructor, Command and General Staff School

IT is a function of the force commander to coordinate the tactics and technique of the ground, naval, and air forces, as well as the subordinate arms and services, in order to develop the teamwork essential to the success of an amphibious operation. There must be close coordination at all levels, in both planning and execution of the operation from inception to conclusion. This coordination is usually executed by staff officers from the different forces working jointly for the entire period.

In an amphibious operation the assaulting infantry is the maneuvering force. They have only such weapons as can be carried ashore with them. Therefore, initially they are dependent upon other arms for fire support.

In land operations it is normal for the infantry to turn to the artillery to furnish this added fire. In the early phases of an amphibious operation the artillery pieces are still afloat and the support must be made available from other arms; namely, naval guns and air power.

In order that all available weapons may be effectively employed to support an amphibious operation, a carefully coordinated plan for employing the fires of ground, naval, and air forces must be developed by joint planning. The maximum effectiveness of artillery, naval gunfire, and air power in support of assault troops can be attained only when such support is carefully planned and coordinated so that profitable targets are attacked at the most propitious time; that each supporting arm is employed upon missions best suited to its capabilities; that duplications of missions are avoided; and that missions executed by each do not endanger elements of the others or of the assault forces.

The logical staff officers to exercise the planning for and coordination of the employment of these supporting arms are the army, corps, and division artillery officers. In infantry regiments and battalions, the artillery representative (artillery battalion commander or liaison officer) should be the principal agent in the preparation of the plans and the coordination of fire support *after* conference with the supported unit commander.

An orderly procedure for developing a fire plan must be followed. Logical steps in formulating the plan are as follows:

1. Consideration of the targets.

2. Determination of the suitability and availability of each of the weapons for attacking the targets.

3. The plan for sufficient control to deliver each of the fires on the targets.

4. Orders and training necessary for the success of the plan.

Consideration of the Targets

Fire support and the scheme of maneuver of the landing force are interdependent. As soon as the landing area has been designated, joint discussion must be entered into as to:

1. Landing beaches to be used.

2. Objectives.

3. Scheme of maneuver ashore.

4. Probable areas of greatest enemy resistance.

Following this discussion, targets in and adjacent to the landing areas can be selected. In selecting the targets, each must be carefully considered as to:

1. The relative importance. That is, how much will the installation retard the progress of the ground elements if it is not reduced or neutralized?

2. The means available to deliver fire on the target.

3. Whether destruction of the target will have any strategic or political aspect.

4. Whether destruction of the target will

slow the landing and advance of the ground elements.

All possible targets cannot be determined during the planning stage. Enemy installations will be moved, fortifications added, and others abandoned during the elapsed time between planning and execution. Reconnaissance agencies must be alert to detect and report any changes of targets in the landing area. Depending upon the relative importance of the reported changes, priorities assigned to the targets must be changed and the fire plan revised to insure that it will give maximum support to the landing forces.

Fire support plans, particularly for scheduled fires, may be greatly facilitated if army, corps, and division artillery officers establish, within their respective echelons, a target information center, this center to be charged with collecting from all available sources information of targets, and classifying the targets as suitable for attack by artillery fire, naval gunfire, and air strikes.

This target information center would consist of a small group of officers and enlisted men from the artillery section of the respective headquarters, and attached photo-interpreter teams. A target information map of all fixed and semifixed targets, appropriate to any of the attacking arms, should be kept posted. A cross-indexed file containing pertinent information of each target located (similar to usual counterbattery file but including other probable targets) should also be kept up to date.

A priority for type targets must also be established. The following is a classification of targets:

Class A

General Nature of Targets: Installations which threatened ships, aircraft, and underwater demolition team operations.

Specific Types of Targets in Order of Importance:

1. Any battery (including torpedo tubes and rocket projectors) which opens fire on our ships or planes.
2. Coast defense guns.
3. Dual-purpose guns.
4. Heavy antiaircraft.
5. Automatic antiaircraft.
6. Covered artillery emplacements within effective range of ships or landing beaches.
7. Open artillery emplacements, where presence of guns is confined by observation, if within effective range of ships or landing beaches.
8. Antitank guns on or near landing beaches.
9. Ships, barges, and boats.

Class B

General Nature of Targets: Installations which threaten assault forces in the movement to shore and landing.

Specific Types of Targets in Order of Importance:

1. Blockhouses and substantial buildings.
2. Pillboxes.
3. Close-in marine mines, beach land mines, and like obstacles.
4. Command posts.
5. Unidentified installations.
6. Earth-covered structures.
7. Areas of heavy growth.

Class C

General Nature of Targets: Installations which threaten or oppose landing force operations after the landing, or which affect ability of enemy to continue resistance.

Specific Types of Targets in Order of Importance:

1. Storage areas.
2. Camp or bivouac areas.
3. Communication centers and facilities.
4. Traffic of sufficient quantity and type to insure probable damage).
5. Urban areas.
6. Railroad centers and important road junctions.

Class D

General Nature of Targets: Installations which should not be fired at prior to landing day.

Specific Types of Targets in Order of Importance:

1. Unoccupied rifle pits, foxholes, and fire trenches.
2. Open artillery emplacements when presence of guns is not established by observation.
3. Empty revetments.
4. Antitank trenches or sections of trenches.
5. Barbed wire.

Class E

General Nature of Targets: Installations *not* to be fired on except on order of higher authority.

Specific Types of Targets in Order of Importance:

1. Hospitals.
2. Churches and shrines.
3. Schools.
4. Selected bridges and other installations.

Determination of Suitability and Availability of Each of the Weapons for Attacking the Targets

There are two primary considerations in assigning weapons to the selected targets:

1. The availability of the weapon at the time the fire is desired.
2. The characteristics of the weapon.

A chart listing all the types of support weapons and their physical location during the progressive phases of the landing is of great assistance in determining their availability to deliver fire at any specific period during the operation.

In a landing attack, ground must be gained before field artillery can be emplaced to support the assaulting infantry. Aviation will usually not be sufficient in quantity to meet all support requirements. Naval gunfire, including that from special support craft, is the major source of effective fire support. Need for naval gunfire does not cease when the light artillery is firing, as medium artillery is usually not available until later. Support continues as far as the range of the weapons or other naval considerations permit, and may augment artillery firing after those weapons are in position.

Initial positions available to field artillery ashore often prevent complete flexibility of fire. Battery positions must be kept clear of beach installations, and fires coordinated with the smaller weapons in the battalion landing team.

Battalion fire-direction for field artillery may not be possible for some time after landing. Naval gunfire supplements field artillery during this period and for some time thereafter. Air support is available but is decreased after initial phases of the landing if air fields or carriers are distant from landing beaches and other fields do not become available promptly.

Careful consideration must be given to the characteristics of each weapon so that its capabilities may be exploited. The mobility, speed, and range of air power permit application, in mass, against selected areas prior to contact by the land or surface forces. Naval gunfire can be delivered at a rapid rate, prior to, during, and after the landing. The large-caliber guns have long ranges and are highly destructive. The landing-craft guns can deliver great volumes of effective area fire on the beaches during the critical period just prior to the landing of the first wave of infantry.

A commissioned representative of each support arm must be present at the various echelons of command for coordination of the fires of their respective arms and to advise in matters of fire support for and affecting their particular echelon. They must be thoroughly familiar with the characteristics, capabilities, and limitations of their respective arms and are responsible that the capabilities of their arms are properly exploited.

The Plan for Sufficient Control to Deliver Each of the Fires on the Targets

The selection and assignment of targets to the weapons of the ground, naval, and air arms determine the amount of each arm necessary to carry out the plan effectively. The next step in the preparation of the fire support plan is to develop a system of control that will insure that the fire from each of the component arms will be delivered on the

proper target, at the proper time, and in the correct amount as determined by the tactical situation of the ground forces.

There are primarily two types of support fires: prearranged fires and call fires. The fire support plan must provide for control of both types.

In so far as is practicable, all support fire missions should be foreseen and planned on time schedules.

Some requests for prearranged fires on certain targets are received from ground unit commanders. Other targets will be selected by the artillery officer after a thorough study of the scheme of maneuver and the information available in the target information center. The missions include harassing, illuminating, interdiction, and defensive fires during the night, preparation and supporting fires for the next days' operation, support of independent operations not pertaining directly to the main operation, and others on terrain of projected operations.

The plans of the lower echelons and requests for support which is not available within the echelon must be submitted to the next higher echelon for coordination and inclusion in their plans in accordance with a definite schedule. This schedule must insure delivery of the requests to the supporting agencies in time for them to deliver the fires in the amount and at the time desired by the supported units.

Called fires are those fires of immediate importance to the maneuver or security of the front-line assault troops, and will necessitate more expeditious control than the prearranged fires. These targets will be so transitory or of such serious nature that fire must be delivered promptly. When support facilities are not available within the echelon, the requests must be transmitted to a higher echelon for execution. Specific requests for fire take precedence over scheduled fires.

Fires from the weapons of the artillery are delivered on the targets by means of liaison, observation, control, and communication units that are integral to the organizations. Exceptions to this occur when chemical mortars, tanks, tank destroyers, or antiaircraft artillery are used in the role of artillery and controlled through a fire-direction center. For this, an improvised system must be used. Once the artillery is ashore and has established its normal communications, little or no difficulty will be experienced in the control of that fire.

Naval gunfire and aerial bombardment are delivered on the hostile shore prior to the landing of friendly forces by means of control integral to each arm. During the landing and for close support after the landing, more effective control must be established.

Some definite procedures have been evolved for controlling both naval gunfire and naval air in support of landings, but when land-based army air forces are used to support landing operations the control systems have varied.

Consider first the control of naval gunfire. Thirteen control units, together with necessary transportation and communication for their effective operation, are integral to a Joint Assault Signal Company (T/O & E 11-147S). Each such company thus has sufficient "Shore Fire-Control Parties" (with transportation and communication facilities to maintain contact with the firing ships) to provide one party for each infantry battalion, each infantry regiment, and one at division headquarters in an infantry division. These parties are the forward observers for the naval guns and are necessary for effective control of their fire. They must be well trained and operate very closely with the headquarters to which assigned.

During the actual landing, each division commander takes measures to insure that at least one "Shore Fire-Control Party" per assault regiment is boated in a landing craft for the purpose of adjusting fire, in an emergency only, during the approach of the assault waves to the beaches, these parties to function only in the event that:

1. Close supporting fire begins to fall short.
2. It becomes necessary to adjust counter-battery fire on or near the beach to knock out enemy guns.
3. It becomes necessary to repeat any fire that may have been lifted too soon.

Firing ships that are given initial call fire assignments in support of the landing must commence efforts to contact "Shore Fire-Control Parties" on or before the time the first waves hit the beach. There may be a considerable time interval before the parties begin to function, and ships may continue to deliver scheduled fires, using air spot, until contact has been established. Only after the "Shore Fire-Control Parties" assume control of the naval gunfire can very close support be given the landing forces.

In addition to the "Shore Fire-Control Parties" there should be present at each headquarters from infantry battalion to army, a naval officer who is specially trained for effective liaison between the Navy and the supported unit.

An artillery officer from the landing forces should be placed aboard each naval firing ship to assist in control of the fires of that ship.

The above control units with adequate means of communication and proper training and functioning will insure control of supporting naval gunfire.

Adequate land-based army air participation necessitates placing well-trained liaison and control units at the various echelons of command in the supported unit. There are thirteen "Air Liaison Parties," with necessary communication facilities, in a Joint Assault Signal Company (T/O & E 11-147S). Thus for an infantry division one party is available for each infantry battalion, each infantry regiment, and one for division headquarters.

Army and corps headquarters must be furnished with similar liaison groups, with communications, if they are not organized with a standard air-ground liaison section.

These liaison groups, with their communication, provide a means for the continuous and rapid flow of battle in formation, through channels, to the Army-Tactical Air Command level. Here information passes through an "Air-Ground Information Center" operating between army and Tactical Air Command. This center would be maintained at an echelon lower than army, if the operation was under control of a lower unit commander, operating separately. The communication facilities for the air-ground liaison system may be supplemented by teams from a Tactical Air Communications Squadron (an Army Air Force unit T/O & E 1-547).

The control of all air operations is a command function. Each Tactical Air Command is provided a Tactical Control Group, or equivalent unit, for this purpose. Elements of this control unit, with their communication and transportation, must be present at all echelons of command from infantry battalion to army headquarters. The air force officer in charge of a forward element of the control unit is called a "Forward Controller." He may take over control of airborne aircraft in the forward areas and direct them on targets.

Ground liaison officers should also be furnished elements of the Tactical Air Command. Initially, air liaison officers should be furnished to ground units to include the infantry battalions.

The commander of an assault infantry battalion or regiment should have available for planning and controlling supporting fires:

1. A representative of the supporting artillery (with communications facilities to maintain contact with the supporting artillery unit or units) to coordinate the planning for artillery, naval gunfire, and air support, to supervise the liaison from other supporting arms and employ them at the headquarters or at the fire-direction center.

2. An air liaison officer to coordinate the planning for employment of air power with the artillery officer. (Either at the headquarters or at the artillery fire-direction center.)

3. A naval liaison officer to coordinate the planning for employment of naval support with the artillery officer. (Either at the headquarters or at the artillery fire-direction center.)

4. A forward controller, with transportation and communications, to control the airborne aircraft for close support. (Normally operates forward of the headquarters.)

5. A "Shore Fire-Control Party" with transportation and communication to control the naval gunfire. (Operates forward of the headquarters.)

6. An "Air Liaison Party," with transportation and communication, to coordinate air support with higher echelons.

At division and higher headquarters the artillery officer on the staff of the unit replaces the artillery liaison officer.

The fire plan must include safety measures to insure that fires from the supporting units do not endanger the supported or adjacent forces and do not endanger other supporting units. Areas adjacent to unit boundaries, ahead of landing craft approaching the beach and forward of friendly front lines, within which supporting fires will not normally be delivered, must be clearly defined. The minimum altitude at which aircraft will operate over friendly ground troops, installations, and vessels at sea, without proper clearance, must be established. Strategic and tactical bomb lines must be established by the ground troops and observed by air units. A system of visual signals for informing pilots of the location of front lines must be developed and made known to both air and ground units.

Precautions must be taken to insure that friendly aircraft are not endangered by artillery or naval gun projectiles in flight. During periods of heavy firing, aircraft should remain above the maximum ordinates of the weapons for the range at which they are firing, or remain outside lines of fire. A system for interchange of this information must be provided. Air sentries should be present at the positions of artillery and indirect fire weapons to keep continuous watch for friendly aircraft likely to pass through the trajectory, and to cause firing to be suspended when friendly planes might be endangered.

Orders and Training Necessary for the Success of the Plan

Artillery, naval gunfire, and air support plans are included as annexes to the field order for the operation. These plans of necessity must be very detailed and must be thoroughly understood by that portion of the command concerned. There should be separate annexes for:

1. The artillery support plan.
2. The naval gunfire support plan.
3. The air support plan.
4. The details of coordinating and controlling all the supporting fires to include safety measures.

These annexes must be written in such a manner that there will be no possibility for misconception of the meaning.

Liaison, control, and communication units must be well trained basically. Time and circumstances permitting, all units participating in the operation should be trained by rehearsals together. Any special or improvised groups must be trained as a unit with the organization with which they will operate, if desired results are to be obtained.

The execution of the fire plan can be insured only through exercise of constant supervision by the commanders concerned. Changes in the fire plan should be effected by proper authority when it becomes evident that by modification, results may be improved.

Today many modern war devices of great destructive power can be built piecemeal and under cover. Sub-assemblies might be secretly made in underground laboratories, and assembled into an annihilating war machine. War may descend upon us by thousands of robots passing unannounced across our shore lines—unless we act now to prevent them.

The training of personnel in time of war, like the production of materials, can only be done in a wholesale manner by utilizing all available facilities and experienced operators wherever found. While we trained men in new skills, we also went to the shops, garages, laboratories and factories of the nation and adapted old skills to new military jobs. Ingenuity of this kind kept us going through a very critical period.—General of the Army H. H. Arnold

Combat Observations of An Infantry Division G-4

MAJOR JOSEPH B. McGEE
G-4 102d Infantry Division (Ozarks)

"WHEN you want something, ask G-4." This is a stock phrase, but a true one in combat, when the G-4 of an infantry division may be called upon to provide for the troops not only the largely constant items of food, water, clothing, bathing facilities, housing and storage space, gasoline, ammunition and equipment, but also a variety of items not normally available or prescribed in Tables of Equipment. Under these circumstances, it devolves upon him to improvise; and it can truly be said that combat brings endless opportunities to the G-4 for displaying initiative and resourcefulness.

Consider, for example, a request received by the G-4 Section of the 102d Infantry Division at three o'clock one morning in late November 1944, when the division was exploiting the breakthrough in the Siegfried Line in the vicinity of Flossdorf, Germany. Casualties were mounting rapidly and litter-bearers in great number were among them. Close to despair, a regimental S-4 called for "Flak Suits." Although all too keenly aware that a "Flak Suit" was an item of equipment not authorized for an infantry division, the G-4 accepted the challenge and promptly produced the required articles The results were very gratifying—and the G-4 Section was pleased that it was never called upon to explain the presence of this unusual equipment.

Special articles of this sort were obtained through normal channels whenever possible; but division supply necessarily operated on the principle that if such channels failed, then the needs of the front-line troops would be met by less orthodox methods. For example, much was procured through local purchases, local requisitions, and local improvisations. White-hooded capes, for which a need developed during the long defensive-offensive fighting for weeks along the Roer in winter weather, were obtained through not only quartermaster but also engineer and military government sources; and both the engineer combat battalion and infantry service companies manufactured detachable runners for use on litters to improvise snow sleds, a requirement which arose during the same period.

Even with respect to these special requirements, however, and despite the complexity of needs and ever-changing situations which arose throughout seven and a half months of continuous combat, the fundamental doctrines of supply and evacuation as taught by the Command and General Staff School proved sound. Many times it became necessary to operate in a manner not prescribed by "the book"; nevertheless the Field Manuals usually furnished a reliable guide for a workable solution, and it was felt that this flexibility enhanced rather than diminished the value of the doctrines. In succeeding paragraphs, some of the ways in which the principles were applied, and in which practice varied from prescribed procedure, are discussed.

Supply

Throughout combat, the Division Quartermaster drew rations for all organic and attached units of the division. It was found that this practice reduced transportation requirements and increased the probability that rations would be drawn in accordance with the schedule set up by the army supply point. Water units were often attached to regimental combat teams for movement and location, a system which was found to be particularly desirable when regimental combat teams were widely separated or moving rapidly. It became good practice to establish the Division Quartermaster Class III Dump well forward, and to augment the capacity of the dump by the acquisition of enough "jerricans" so that 2,200 cans, or 11,000 gallons of gasoline, could be kept in the dump or en route from the army supply point to the division dump. This dump served all forward combat units, including attached tank and tank-destroyer battalions.

Clothing was procured and supplied in accordance with prescribed principles, except that the distance from the division to the army supply points often exceeded the Field Manual's expectation. This statement is also applicable to the supply of miscellaneous items.

Early in combat, it became evident that the prescribed method of supply of engineer and signal items was too slow and inconvenient for giving efficient service to the troops. Accordingly, it was found necessary to convert both the Division Engineer Supply Section and the Division Signal Supply Section from "offices" which simply processed requisitions to operating units which actually procured and distributed the items needed. Also, in order to meet the urgent requirements of the troops for many fast-moving articles not ordinarily stocked, the maintenance of a division stockage of engineer and signal supplies became mandatory. The demands of units for medical supplies necessitated the stocking of a larger reserve in the Division Medical Supply Section than had normally been carried; and the problem of transporting and storing these supplies was solved by the use of a captured German trailer, which was used as a mobile medical supply dump.

Ammunition supply was normal, except that it was found advantageous to attach a Chemical Warfare Supply Section to the Division Ammunition Office. This practice permitted the troops to submit all ammunition requirements to one agency and thus resulted in a saving of transportation, time, and confusion.

Evacuation

Personnel was evacuated in normal fashion, with a few exceptions brought about by combat conditions. Due to lack of cover and concealment, battalion aid stations were usually located farther to the rear than the prescribed 500 to 800 yards in order to afford more protection to the wounded during treatment. Cellars in buildings in near-by towns were ideal places for aid stations; and if they were farther to the rear than desirable, they were used anyway. This practice did not delay evacuation, because casualties were carried relatively short distances by hand to loading points, from which they were evacuated to battalion aid stations by ¼-ton vehicles, modified to transport litters. Furthermore, evacuation from battalion aid stations to collecting stations was never by hand, as contemplated in the Field Manual, but always by ambulance or other vehicles, this practice being made possible due to the relative accessibility to battalion aid stations.

When casualties were heavy, it was found that the number of aid men and litter bearers normally available in a rifle battalion was not adequate. However, the procedure outlined in the preceding paragraph made it possible for each collecting company to make nearly all of its litter platoon available to the infantry regiment which it supported. Nevertheless, it was sometimes necessary to use, for litter-bearing purposes, personnel from regimental service units and from other units not directly engaged in the battle.

The recovery and evacuation of matériel was accomplished generally in accordance with prescribed procedure, except that, during fast-moving operations, it was impracticable for combat troops to perform the task of battlefield recovery in a thorough and complete manner.

Transportation and Traffic

From the time the division landed in France until it dug in on the east bank of the Elbe River, it periodically experienced shortages in all classes of supply. In most cases, these conditions were short-lived, and either "impetus from the rear" provided the needed items, or changes in operational plans, in weather, or in other factors, alleviated the situation. However, during all of this time, the division experienced a shortage of transportation, and, while its acuteness naturally varied considerably with the tactical situation, it can be said that no conditions ever arose which eliminated it.

Even normal transportation requirements taxed the division's means, but many special

demands arose which added to the strain. G-1 required trucks to take men to rest centers, or for baths; G-2 needed transportation for moving prisoners of war and wanted political personnel; G-3 demanded trucks to motorize dismounted elements of the division; and G-4 continually received calls for trucks for countless reasons. Transportation was our continual bane but, by the same token, our salvation.

It was found, too, that the principles of assignment and reassignment of transportation for the shuttling of troops, as taught in our service schools, gave insufficient consideration to the strain which the performance of normal missions over extended distances places upon all organic transportation, and made inadequate allowance for the meeting of the special demands which are bound to arise. All too often, the "school solution" is to attach to the division sufficient quartermaster truck companies to handle the task; but it was our experience that such companies, of which three were needed to meet all demands, could be secured on but one-third of the occasions when they were required, and rarely at full strength. As a result, the division frequently resorted to the expedient of "grounding" the engineer battalion and the medium field artillery battalion, and sometimes attached units, in order that the vehicles of these units might be used to move infantry elements.

Thus, transportation was always in short supply; but traffic was usually a major problem, especially during major operations and in fast-moving situations. The prescribed principles of traffic control were used by the division throughout our campaigns, and combat experience proved them to be sound. However, it was necessary, in order to operate Traffic Headquarters successfully, to augment the G-4 Section by one officer and two enlisted men.

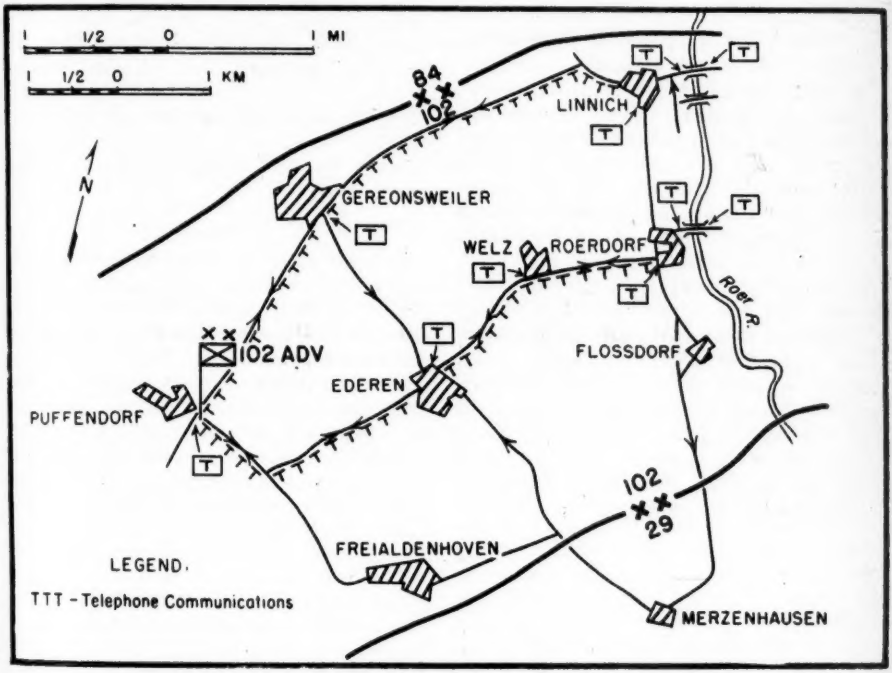
A most interesting operation, and a good school study, at least from the point of view of traffic control, was our crossing of the Roer River in the vicinity of Linnich, during the period 23-26 February 1945 (see sketch). Here the limited number of bridges and roads available, and the necessity to provide continuous support to our forces once they had crossed this mad stream of icy water, made the problem of traffic control one of paramount importance. Two infantry divisions and an armored division was forced to bottleneck through a small village fully exposed to observation and fire of the German troops on the high bank east of the river.

To meet this situation, an intricate system was set up in the forward area just west of the river, with a mission of exercising complete control over the movement of all vehicles in the area. The sketch shows the road net, traffic posts, and traffic communications system. Since practically all traffic had to pass the Puffendorf crossroads, it could be easily controlled at that point; and, accordingly, Traffic Headquarters was initially established there. The traffic control telephone net consisted of two more or less parallel circuits, one from Puffendorf to Gereonsweiler to Linnich, the other from Puffendorf to Ederen to Welz to Roerdorf. Thus, when the necessity arose, due to trouble at the bridges, it was an easy matter to halt a column or to divert it to another bridge, even after it had passed the crossroads at Puffendorf.

Traffic Headquarters, in conjunction with the Troop Movements Division of the G-3 Section, strictly controlled the movement of all units in support of the operation. Movement schedules and charts were worked out for those units which were expected to cross the river in the early stages of the operation; their priority of crossing being based upon recommendations which had been made by unit commanders, with a view to insuring that weapons and other equipment would arrive on the east bank of the river in a specific order and as needed. Every vehicle group was assigned a movement number, in order to permit reference in the clear over the communication system without disclosing unit designations. Movement orders were issued by Traffic Headquarters, giving

every possible detail as to how and when units would move their vehicle groups from assembly areas on to the road net, and thence across the river.

That this control system was highly successful was proved by the dispatch with which the division and its many attached units, as well as many corps and army units, were able to move through this bottleneck over the Roer to participate in the flight to the Rhine.



102d Infantry Division Traffic Circulation Plan for Operation "Grenade" Effective 23 February 1945.

Service Troops and Trains

The operation and supervision of service troops in the 102d Infantry Division differed somewhat from generally accepted principles. For example, the Division Ordnance Office and the Office of the Division Quartermaster were located with the ordnance company and the quartermaster company respectively, which units, in turn, were located in fairly close proximity to each other. Also, the Signal Supply Office was located with the Quartermaster, and the Division Ammunition Office with the Division Ordnance Office. Maximum staff supervision, and ready accessibility to troops, resulted from these practices.

Supporting quartermaster laundry and bath units were seldom adequate and were always slow in moving up; and the Utopian laundry and bath unit, which would furnish a soldier a bath and launder his clothes all in a matter of a few minutes, still remains an idea in the Field Manuals. To meet the requirements and expectations of the troops, the Division Quartermaster was always on the alert to locate and utilize any civilian laundry or bath house; and service companies of front-line units also were quick to

learn that "home laundries" and "house bathing" could be put to good usage. It is believed advisable to make a laundry and bath unit permanently available to an infantry division once it arrives in a theater of war, and to augment the division quartermaster company to permit stockage of clothing sufficient to furnish a change for at least one regimental combat team at a time. Periodic hot showers and a change of clothing are mandatory for combat troops.

A continuous effort was made to keep all organic and supporting service elements well forward and readily accessible to the combat units. The disposition of unit trains varied with the situation; and the decentralization of kitchen and ammunition trucks to form battalion trains proved very satisfactory in fast-moving situations.

Although the cooperation of supporting service units was at all times satisfactory it is believed that units which are placed in direct support of a division should be attached "for operational control." Such attachment would be especially desirable in the case of ordnance maintenance companies, whose movements and operations could thus be more efficiently controlled by the Division Ordnance Officer.

Accommodations

The 102d Infantry Division found it necessary to utilize many varied types of buildings in the course of its operations, for quarters, command posts, rest centers, hospitals, storage, and other purposes. Schoolhouses were favorite sites in both Holland and Germany; but breweries, coal mines, foundries, railway shops, tank factories, office buildings, castles, and cottages all had their advantages and uses. For example, an unfinished V-1 underground factory at Valkenberg, Holland, and an air-raid shelter in Krefeld, Germany, were used to excellent advantage for the storage of organizational impedimenta.

Conclusion

It can be said, then, that the combat experience of this division proved that the principles prescribed for the manifold operations of the Division G-4 Section, and its allied special staff, are very sound. It was further shown, however, that the application of those principles must be varied to meet the situation, and that, in some cases, there is need for making more generous provisions in Tables of Organization and Equipment for the accomplishment of combat missions.

Order of Battle

G-2, 3d Infantry Division.

THIS is an extremely valuable intelligence adjunct in the hands of the right OB officer. Everything depends on the OB officer's ability to interpret minute indications picked up from identifications, documents, etc. This means he must have thorough grounding in tactics, enemy organization, history of units on the local front, and must keep meticulous files on personalities and *Feldpostnummern* [APO's]. (Incidentally, many identifications have been made by our OB teams through use of these files.) OB information should be disseminated to all units through G-2 Periodic Reports.

The Destroyer

CAPTAIN MILES R. BROWNING, *United States Navy*
Instructor, Command and General Staff School

DESTROYERS are often referred to as the "work horses of the fleet." The description is appropriate, for these swift and versatile ships are constantly being called upon for a wider variety of tasks than any other type of combatant vessel. They are a *sine qua non* of every form of naval activity at sea. Both during peace and in wartime, the unending demands for their services make them the most overworked units of the fleet by a wide margin. Not only are they at sea a greater proportion of the time than are the heavier vessels, but also, during every hour of every day of cruising, they are required to perform a multiplicity of special tasks which they, and they alone, are qualified to carry on. No important sea surface action took place in World War II without the presence of destroyers in the thick of the combat; a statement which can not be made of any other type of war vessel.

The destroyer is a comparative newcomer in the national stable of sea fighters. Unlike the battleship and the cruiser, the destroyer had no prototype in the days of sail. Her evolution dates from 1892 and the aircraft carrier is the only member of the fleet first-line family who is younger. In her brief life span of fifty-three years, the destroyer has proved her worth beyond any question, has crystallized her main characteristics and her tactics, and has taken her place as a mature and indispensable weapon of sea power.

The destroyer was first designed and produced for the purpose of combating torpedo attack by a small, fast, surface torpedo boats against large vessels. This latter menace commenced to take serious form in the last two decades of the nineteenth century when "torpedo boats" made their appearance in the world's fleets. In the bitter naval rivalry of the time between France and Great Britain, the French building program stressed large numbers of such craft to carry and launch the new "automobile torpedo." Britain was compelled to devise some effective countermeasure and, as a result, conceived and developed the "destroyer"—a larger, faster, more heavily gunned vessel than the French torpedo boat and more than a match for it. HMS *Hornet* and *Havoc*, designated as "His Majesty's Torpedo-boat Destroyers," appeared in 1892 as the first of their type in world history. Judged by today's standards, they were tiny vessels, of 250 tons displacement, twenty-seven knots speed, and armed with one 3-inch gun and two 14-inch torpedo tubes. Such as they were, however, they were so much faster and more seaworthy than the torpedo boats which they were designed to counter that they not only fulfilled the hopes of their designers in that regard but also quickly usurped the latter's offensive functions of attack with torpedoes. The distinction between "destroyers" and the torpedo-boats themselves rapidly disappeared. All major powers commenced the production of "torpedo-boat destroyers." The early designs averaged in the neighborhood of 400 tons displacement, twenty-seven to twenty-eight knots speed, one or two guns of about 3-inch size and two torpedo tubes. Successive classes, which appeared at brief intervals in all navies, increased rapidly in size and armament; however, the concept of the type limited its employment to coastal waters and did not envisage it as a "deep-sea" weapon. None of the earlier designs was capable of extended cruising or of operation in rough water. They were operated in groups or "flotillas" under control of a cruiser flagship which was necessary to provide command-post facilities for their direction.

As time went on, the "torpedo-boat" part of the unwieldy type name dropped off, but the "destroyer" designation was retained and the ships continued to increase in size and in gun and torpedo armament. In 1910 Britain commenced experimental development of a class of destroyers called "leaders." They were intended to provide adequate flag facilities for tactical command of destroyer flotillas and thus avoid having to use cruisers for the purpose. HMS *Swift*, launched in that year, was both the first of the new class and the

largest destroyer built by any nation until some twenty years later. *Swift* was of over 2,200 tons displacement, thirty-five knots speed, and carried four 4-inch guns. The British built a number of classes of "leaders" after the *Swift*, but they were all smaller vessels than she. The class was of questionable value from the outset and was never extensively developed. Except for this somewhat abortive leader development, destroyers throughout the world had achieved a measurable degree of standardization at the outbreak of World War I. As of that time, they were generally of close to 1,000 tons displacement, capable of speeds slightly above thirty knots, and carried from four to six torpedo tubes and a powerful battery of up to six 4-inch guns. In the purview of the naval tacticians of the day, their sole important field of useful employment in action lay in delivering mass torpedo attacks against enemy capital ships.

World War I quickly broadened the scope of destroyer operations. The German submarine fleet conducted undersea warfare on a scale never before imagined. Not only did the deadly U-boats infest shipping lanes at their focal points near the British and French coasts, but they ranged across the oceans to the far shores and harassed Allied shipping along every mile of the high seas. The devising of some system of effective convoy protection against them became the most urgent need on the Anglo-French war agenda, for the U-boat, alone and unaided, was coming perilously close to treating the world to the amazing spectacle of successful blockade of the greatest sea power in existence. The problem presented itself in pitilessly clear outline; escort vessels were needed at once and in enormous numbers, capable of relatively long-range ocean cruising to accompany convoys, equipped to detect approaching submarines and to destroy them when located. Resources at hand were unsuited to the task. Cruisers had the necessary range and a superfluity of armament, but they were entirely too costly in time, materials, and manning crews to be produced in the numbers needed; furthermore, they were themselves highly vulnerable to submarine attack by reason of their size and hull depth. Destroyers of current design did not suffer from these drawbacks, but they were incapable of deep sea operations due to their short radius of action and their lack of seaworthiness. They did, however, possess characteristics which lent themselves to modification into what was required more readily than any other existing design; and it was to destroyers, accordingly, that plastic surgery was applied to fit them for the task. They were given more freeboard to enhance sea-keeping ability and larger hulls to carry more fuel and thus increase endurance. Sound-detecting equipment was developed and installed in them to aid in detecting submerged U-boats. Their guns—always at a hopeless disadvantage by themselves in attack upon a target which had merely to submerge to escape—were augmented by the newly developed depth charge. The destroyer emerged from these face-lifting operations as the antisubmarine weapon par excellence, and most certainly saved Britain from disaster at the hands of the German undersea forces. The U.S. "flush-deckers" of our 1917-1918 building program epitomized the destroyer as it appeared at the close of World War I. They were 1,200-ton ships, exceptionally seaworthy and fully capable of crossing the North Atlantic in any weather and under their own power, armed with four 4-inch guns, depth charges, and a powerful torpedo battery. They were equipped with sound detection gear, were capable of a speed of thirty-four knots, and were satisfactorily maneuverable. We built nearly three hundred of these splendid ships and many of them served with distinction in World War II, a quarter of a century later.

Following the 1918 armistice, all naval construction except the tag ends of the war programs of the victorious allied nations came to a virtual standstill. A few years later, the Washington Naval Treaty further enforced this stagnation, with the result that it was not until about 1930 that any new

design features appeared in destroyers. During the interim, the naval architects of the maritime powers were busy laying down paper design after design, incorporating the distinctive precepts of their respective national fleet philosophies. In consequence, when active building was resumed, the new destroyers exhibited widely divergent features. In broad outline, the destroyer programs of the major powers were marked by the following outstanding characteristics during the 1930-1938 period:

a. The United States built vessels of from 1,400 to 1,500 tons displacement, five 5-inch *dual-purpose* guns in the main battery, and very powerful torpedo batteries of up to sixteen tubes. In addition, the U.S. brought out a temporary revival of the old British "leaders" in the USS *Porter* and *Somers* classes, totalling thirteen ships. They were of 1,850 tons, thirty-seven-plus knots, and carried eight 5-inch guns which were *not* dual-purpose. Construction of these ships stopped with the *Somers* class, and they have since been modified by cutting down the main battery strength and increasing the antiaircraft fire power, in line with war experience. The most noteworthy points in the U.S. developments during the eight-year period were the 5-inch dual-purpose main batteries which gave the vessels tremendous antiaircraft fire power without sacrificing surface gun power, and the exceptionally heavy torpedo batteries—by far the heaviest in the world. The standard installation of dual-purpose guns was peculiar to U.S. design; World War II was to demonstrate that this innovation was the most far-reaching advance in destroyer armaments since the type was born. A major weakness of the U.S. ships turned out to be that they were all carrying more armament than their displacement warranted. In later years it was found desirable to remove one 5-inch gun to improve their stability and seaworthiness.

b. Great Britain, during the same period, paralleled U.S. design rather closely. The British ships were slightly smaller on the average, carried four or five 4.7-inch guns as compared to our 5-inch, and a generally lighter torpedo battery than their American contemporaries.

c. Japan, war-bound and eyeing U.S. construction fearfully, matched the successive American classes with ships a little larger and a little more heavily gunned. The Japanese, however, made no effort to match the U.S. *Porter* and *Somers* leaders. A feature of the Japanese vessels was that they were nearly all equipped to lay mines.

d. Germany, a late entrant in the race, built vis-a-vis Britain much as Japan was doing in relation to the United States, i.e., somewhat heavier and more powerful vessels, ship for ship. The German destroyers were featured, also, by very strong automatic antiaircraft batteries. A large number of them, like the Japanese, were equipped as minelayers.

e. France, and later Russia, went in heavily for very large "super-destroyers" of great gun power and speed. They each built a considerable number of 2,900-ton vessels which were, in reality, small light cruisers. They were at the time, and they still are, the largest units classed as destroyers that have ever left the building ways.

f. Italian design specialized in very high speeds—up to thirty-nine knots. The ships were of about the same displacement and gun power as the British vessels of the time, but they were all characterized by extremely powerful antiaircraft automatic gun batteries. Also, in common with the practice of the other two Axis partners-to-be, the Italian destroyers were equipped for minelaying.

x. Common to the destroyers of all nations was the installation of the most modern sound-detection equipment available and powerful depth-charge batteries.

This was the outline of the world-wide status of destroyer evolution a scant seven years ago. As World War II approached and finally broke, development of the type was frantically accelerated by all the naval powers. As usual when time presses, unorthodox and experimental models were dropped, and

designs with proved characteristics were concentrated upon. The "super-destroyer" threat, exemplified by the *Voltas* and *Leningrads*, evaporated; they were far too expensive and vulnerable for true destroyer work. Very early in the war the bitter lessons learned by the British and French in the Mediterranean and the western sea approaches to Europe forced the installation in their destroyers of every automatic antiaircraft weapon upon which they could lay their hands and for which space could be found on the crowded topsides of the ships. New destroyer designs carried dual-purpose main batteries, and every other fleet in the world looked with envious eyes at the U.S. ships already afloat, which had incorporated them from the outset.

One other major innovation appeared—the "escort" destroyer. This is a specialized class designed for the primary purpose of convoying shipping. Its development stemmed from the critical shortage of ocean escort ships in the Atlantic in the face of the Axis submarine campaign, where World War I history was repeating itself and the United Nations were perilously close to disaster. The destroyer proper had grown in size, speed, gun power, and *expense* to a point where it was both wasteful to employ it exclusively on escort duty which did not permit full exploitation of its potential, and impossible to provide it in the needed numbers. Smaller, slower, and more lightly armed ships were capable of the work, and the escort destroyer was produced to do it. Thus the war has brought destroyer evolution to the point where we now have two main classes of destroyer: the one, which we may call the "fleet" destroyer, a first-line weapon designed to go into action with and as a part of the battle fleet; the other, the "escort" destroyer, a smaller, slower, and less powerful edition designed for the screening and escort of shipping.

Since 1940, U.S. production in the tremendous war building program has dominated the destroyer field. It may be taken properly as the index of design development, and the U.S. "fleet" and "escort" destroyers of 1945 are world-wide prototypes at the present time. This fleet destroyer is a vessel of some 2,200 tons displacement, armed with six 5-inch dual-purpose guns and some twenty automatic antiaircraft weapons, ten torpedo tubes, carrying a heavy depth charge battery, and equipped with the most modern electronic, fire-control, communication, and sound-detection equipment. She is capable of extended sea cruising and her ability to fuel at sea from any type of vessel renders her able to accompany major forces for weeks and even months at a time. She can make some thirty-eight knots. She is an expensive ship to build and operate, costing more than the light cruiser of a few years back. She is a superb fleet weapon, both offensively and on defense, and she is deadly against submarines and aircraft. She carries practically no armor, but her highly developed damage control equipment makes her a far tougher fighter than the "tin cans" of earlier days. She was employed in every theater of the recent war and on every conceivable task, ranging from scouting and patrolling to unsupported gun duels against Axis ships. She is probably best known for her invaluable contributions in the screens of our fast carrier task forces, and as close naval gun support for landing troops.

The modern escort destroyer is a 1,400-ton ship, armed with two 5-inch dual-purpose guns and some fifteen automatic antiaircraft weapons, three torpedo tubes, a powerful depth charge battery, and otherwise equipped in comparable manner to her big "fleet" sister. She is similarly capable of long-range, deep-sea cruising, but her top speed is only about twenty-four knots. She is at her best against submarines, but she can give an excellent account of herself under air attack. She is not a first-line ship and she is not intended to accompany the battle fleet into action. In the Atlantic, she was teamed with the "escort" aircraft carrier—the so-called "jeep"—to break the back of the Axis submarine force. The escort team so formed was superbly successful in its task, and the

ships worked so well together that they were continued in double harness in the Pacific. Here, they were employed mainly as air support groups for amphibious landings and they proved again that, together, they were a "natural" for operations in that class. The escort destroyer is now a proven "type within a type," and she is here to stay.

Refrigerators for Jungle Fighters

From *The Illustrated London News* 25 August 1945.

EARLY in 1944 the question of supplying fresh meat and vegetables right up to the front line to troops operating in Burma, men well in advance of base stores and often days in advance of the railhead, became a pressing one. The problem was to preserve frozen or chilled meat from the base by a rail journey of perhaps eight days to railhead, and a lorry journey of about four days beyond. There was also transport by river or coast barges to be provided for. After considering various methods, it was decided to devise a portable refrigerating plant suitable for rail or barge transport, together with refrigerated containers for rail or road transport, the holds of barges being fitted up as cold stores. It was, of course, essential to run the refrigerating unit so as to maintain meat and other foodstuffs at the required temperature. Considerable thought was given to the most suitable refrigerant, and it was finally decided to use an ammoniabrine (calcium chloride) system, the brine being circulated through coils in the containers or in the holds of barges. There are various types of containers in general use—the 170, the 22, the 8-cubic feet, and the smaller 0.8-cubic feet container used for carriage on pack mules, although today the ubiquitous jeep can go almost anywhere and carry a large container. The refrigerated train unit usually consists of twenty 170-cubic feet containers, five such being carried on each flat car, and in the center of the train a flat car bearing the portable refrigeration unit. All containers are interconnected to the refrigeration unit by flexible brine pipes so that cooling goes on continuously while the food is on the journey over hundreds of miles from the base depot to the railhead, where the containers can be transferred to three-ton trucks—where there are suitable roads, one container per truck. Where the state of the country is not suitable for the trucks, the food is placed in the smaller containers and taken onward in jeeps or jeep-trailers, and even, if necessary, on muleback. By this means troops far in the jungle are well fed.

Flamethrower Tanks in the Pacific Ocean Areas

COLONEL GEORGE F. UNMACHT, *Chemical Warfare Service*
Chemical Officer, United States Army Forces, Middle Pacific

THE employment of flame as a military weapon has again proved its value in our defeat of Japan. Much has been written of the devastation wrought by the Chemical Warfare Service's potent and highly destructive incendiary bombs employed by the Air Forces in the almost complete destruction of Japan's war potential. Up to now, little has been mentioned of the important part the Pacific Ocean Areas main armament flamethrower tank played in obtaining the important Jap-held bases so urgently required for the continuance of our aerial flame attack against Japan.

The Jap was a master in concealing his ingeniously constructed pillboxes and in the employment of well-camouflaged cave networks. Our assault of Makin and Tarawa indicated that even direct hits from large-caliber Army and Navy guns and field pieces were not always successful in demolishing these strongpoints. The portable flamethrower was effective, but the mortality rate of flamethrower operators was high. To obviate this situation the Chemical Warfare Service first installed portable flamethrowers in light tanks. These were employed in the Kwajalein operation with moderate success, despite the fact that the installation was hastily constructed and there was little time to train personnel. However, this operation indicated that we were on the right track, and all available Chemical Warfare resources in this theater were immediately employed in perfecting a suitable flamethrower tank with adequate fuel capacity and range.

By a fortunate circumstance, several Canadian Ronson flamethrowers were obtained from Canada, and after considerable modification they were mounted in LVT's and light tanks, with added fuel capacity. After many demonstrations and mechanical adjustments, twenty-four flamethrowers were installed in light tanks. Fuel capacity was increased to 170 gallons of flame fuel in each light flamethrower tank. This was done despite the lack of trained personnel, and after borrowing personnel and materials from a most cooperative Navy. As the invasion of Saipan was then imminent, a twenty-four hour production and training schedule was maintained. The Marines landed on Saipan with twenty-four of these flamethrower tanks divided equally between the two Marine divisions. Their successful employment is now a matter of historical record.

As a result of the general feeling among combat commanders that the medium tank should replace the light tank in future operations, we immediately redesigned the flamethrower for installation in medium tanks. A careful survey of the situation revealed that the flame fuel supply could be increased to 300 gallons, thus giving each tank a total of fifty individual bursts of flame, each capable of neutralizing an enemy position. The added capacity also eliminated the necessity of constant refueling during combat.

The first pilot model was produced and test-fired before several hundred army, corps, and divisional commanders and their staffs, and won immediate approval. The Tenth Army and the Marines coordinated their requirements, which totaled 126 main armament flamethrower tanks. Mainland procurement was immediately initiated, shops were procured at Schofield, technical and mechanical personnel obtained from local resources, and the Chemical Warfare Service found itself in the manufacturing business. Despite many heartbreaking delays and the necessity of overcoming many technical and mechanical difficulties, the actual production was initially maintained at one complete tank every three days. As supplies arrived, this was gradually increased until we reached a production peak of one complete flamethrower tank a day.

During this period the Iwo Jima operation was scheduled, and as the Marines were charged therewith, a total of eight flamethrower tanks was made available. This was the first combat test of our POA [Pacific Ocean Areas] flamethrower tank, and its suc-

cess exceeded our fondest hopes. Some of the flamethrower tanks were refueled seven times a day, and during the last stages of the operation Marine infantrymen would not advance until the flamethrower tanks cleared the way. The tactical situation was such that a frontal attack had to be employed. Japs who were not killed outright by flame were flushed from their defensive positions and taken care of by the small-arms fire of Marines who closely followed the flamethrower tanks.

Flamethrowing tank in action at Coral Ridge, Okinawa (Signal Corps photo).

As a result of the extensive cave networks found on Angaur and Peleliu, Lieutenant General Robert C. Richardson, Jr., Commanding General, USAFPOA [United States Army Forces, Pacific Ocean Areas], directed immediate development work on a hose extension which could be coupled to the tanks holding flamethrower fuel and then brought in position so as to attack caves which were in such rugged terrain that the main armament flamethrower tanks could not be brought close enough to attack the positions. Three of these hose extensions were supplied the Tenth Army for the Okinawa operation and proved invaluable on many occasions. Up to 450 feet of hose were used, and hundreds of Japs were killed in caves which were previously inaccessible to flamethrowers or any of our other weapons.

With the Okinawa operation scheduled for

1 April 1945, all facilities were operated at peak capacity, production and training being accomplished simultaneously. Tests on various mixtures of flame fuel were made, incorporating therein the latest scientific data.

The 713th Tank Battalion was converted to an armored flamethrower battalion, all personnel being trained in the nomenclature, repair and maintenance, fuel-mixing operations, and in what was then known of flamethrowing tank tactics. This battalion landed on Okinawa on 7 April 1945 with fifty-four main armament POA flamethrower tanks, the general characteristics of which were as follows:

Vehicle: M4, M4A3.
Location of flame gun: in 75-mm gun tube.
Fuel capacity: 290 gallons.
Location of fuel units: in hull, beneath basket.
Total firing time: 2½ minutes.
Effective range:
Unthickened fuel: 40 yards.
Thickened fuel: 60-80 yards.
Maximum range:
Unthickened fuel: 70 yards.
Thickened fuel: up to 176 yards.
Fuel propellant: carbon dioxide.
Approximate weight added to tank (fuel loaded): 1,500 pounds.
Armament displaced: 75-mm gun.
Ignition system: gasoline-electric.
Traverse: 270°.
Elevation and depression: same as normal 75-mm gun.
Armament: coaxial 30-caliber machine gun in turret and 30-caliber bow machine gun.

The flamethrowing tanks, with a capacity of nearly 300 gallons and spouting flame from the barrel of the 75-mm gun, were used throughout the campaign with highly successful results. The terrain on Okinawa allowed a generally freer movement for wheeled and tracked vehicles than had Iwo Jima. However, the going was seldom easy, due to steep ridges and escarpments, terrible mud on the roads from heavy rains and constant traffic, and soggy rice paddies. These factors restricted the massing of flamethrower tanks to build a "wall of fire" which the battalion thought "could have been very effective in some instances."

The armored flamethrowers were usually employed as a company of eighteen flamethrowing tanks attached to a normal tank battalion, as a platoon of six flamethrowing tanks attached to a regular tank company, or as a section of three flamethrowing tanks attached to a regular tank platoon. The flame tanks were generally employed within the tank-infantry team in one of the following ways:

1. A section of three flame tanks acting as an integral part of the tank platoon.

2. A section of three flame tanks attached to a tank platoon and remaining in a forward assembly area on call. When a flame-tank target developed, the flame tanks were called up and supported by other tanks until the mission was accomplished. They were at all times under the control of the regular tank-platoon leader who was not always capable of directing flame-tank operations, due to lack of previous coordinated training. This was the most common type of employment.

3. Flame tanks operating as in "2" above, with the infantry in close support of tanks and flamethrowers.

4. Flame tanks operating with infantry alone.

In most cases, flame tanks operated out in front of the infantry until the area was cleared sufficiently for the infantry to advance. In many cases the flame-tank crews felt that the infantry could have given closer support, and thus have been able to offer better protection and support, and to follow up flame attacks rapidly and occupy immediately the ground taken.

Part of the fuel pre-mixed and taken with the battalion to Okinawa was broken down by water and could not be used. Much Napalm fuel was mixed in rear areas each day, so that flamethrowers could refuel with minimum delay.

The 713th Tank Battalion, Armored Flamethrower, Provisional, was in action continually from 7 April 1945 to 30 June 1945, a

period of eighty-five days. Highlights of some of the action, taken from the operations report of the 713th Tank Battalion, are described in the following paragraphs.

29 April 1945.—Three flame tanks from Company C, supported by tanks and the 383d Infantry, advanced, firing on caves and ridges. Then one flame tank dismounted its cannoneer and took on a front-line infantryman who knew and could designate known targets. Flanked by regular tanks, the big flamethrowers poured flaming Napalm into a large cave containing approximately 100 enemy soldiers. Then, advancing farther through a cleared minefield, 800 yards ahead of the infantry, tanks and flamethrowers fired and blasted cave positions. Many Jap soldiers were seen, both in and out of caves, and many were flamed directly. One thousand five hundred gallons of Napalm were fired, and the infantry credited the tanks and flamethrowers with 260 of the 290 Japs killed that day.

Flamethrower extension hose in operation (Signal Corps photo).

11 May 1945.—Six flame tanks from Company B supported tanks and the First Marines in the region west of Dakeshi. At 1100 all six flamethrowers assaulted enemy positions, sweeping and probing caves and dugouts with streams of flame. About 100 Japs were flushed from their hideouts, and a 47-mm antitank gun destroyed with Napalm. An ammunition dump exploded. One flame tank received two hits from an enemy antitank

gun, and the crew was wounded by the explosion of a larger shell as it evacuated. A second flame tank began to tow the disabled vehicle away, when a shell from the same antitank gun smashed through the side of the second flame tank and ruptured the Napalm tanks. Jellied fuel flooded the crew compartment but did not catch fire, and the tank retreated while a third flame tank covered the withdrawal with machine-gun fire. The remaining three big flamethrowers continued to burn caves and houses in the vicinity until the close of the period.

12 June 1945.—Two flame tanks from Company C supported Company C of the 711th Tank Battalion and the 32d Infantry. Confronted by a steep escarpment which flame tanks could not adequately burn, the hose extension to the flame gun was coupled up and hoisted by rope up the fifty-foot escarpment. Flame was then fired over the far edge and was blown back into caves by the wind. Supporting infantry killed twenty Japs, and six more were killed by the flame. Several ammunition dumps were blown up. The hose attachment was then moved over fifty yards and attached to the other flame tank. "Two pillboxes were taken under fire and approximately fifty Japs were killed, some killing themselves. Numerous explosions occurred with Jap bodies thrown in the air. The flamethrowers below the escarpment moved into position to destroy thirty Japs who were trying to escape the flame along the ridge. Three hundred gallons of Napalm were expended. In the afternoon, five flamethrowers were lined up at the base of the cliff to fire at caves and pillboxes. Thirty Japs were killed and a Jap machine gun which was firing on the flamethrowers was destroyed with its crew of three, who rolled down the escarpment." One thousand five hundred gallons of Napalm were expended in the afternoon action.

14 June 1945.—One flame tank was "given the mission of firing a rocky area on the top of the escarpment." The flame tank "moved through the tanks and caught the Japs by surprise. His first burst of flame scattered Japs in every direction and he was credited with killing fifty."

19 June 1945.—Two platoons of Company C flame tanks supported the 32d Infantry and fired eight loads of Napalm at brush, caves, pillboxes, and cliffs. One tanker, a sergeant, fired two loads at caves and brush from which sniper fire was holding up the advance. "When the infantry was again halted, Sergeant B____ attached fifty feet of hose to his tank. With the help of the infantry he lifted it to the top of the escarpment. As the infantry said they had no one to handle the hose, Sergeant B____ handled it himself, leading the infantry through a sniper-infested area. Although the hose leaked badly, and Sergeant B____ was drenched with Napalm, he continued until the fuel was gone. He saw only two Japs burned, but the infantry said many more were killed. The rifleman nearest Sergeant B____ fired thirteen clips from his M-1 in support. Sergeant B____'s performance drew high praise from both the infantry and tankers." Five more loads of flame-tank fuel knocked out a 75-mm gun, and eliminated sniper and mortar fire which were holding up troops, and the infantry went ahead.

22 June 1945: Company A.—The eight operative flamethrowers in the company were all attached to Company C, 763d Tank Battalion, and the 305th Infantry with the mission of taking Hill 85. The flamethrowers and standard tanks were split up in two groups, one to support the infantry on each side. The group on the left was able to place fire and flame ahead of the infantry with good results, but those on the right (north) side ran into trouble. Without close infantry support they were unable to defend themselves when they encountered a number of Japs in shell holes and caves. Two flamethrowers were satchel-charged, one of which was put out of action. This group withdrew and joined the other. The hill was taken and the tanks released at 1600. The company killed fifteen Japs during the day.

Company B.—The 1st Platoon committed three flamethrowers to support the 6th Marine Division in mopping up TA 7255-BGH,

7456-QONI. One ammunition dump and one oil dump were fired. The 2d Platoon supported the 7th Marine Regiment in mopping up TA 7561, 7661. Canefields, caves, brush, and rubble were burned in this area. The 3d Platoon mopped up in TA 7559-TVWNS, 7659-V. Brush and caves were burned. The company burned 6,000 gallons of Napalm, killed forty-seven Japs, and took two prisoners of war.

Company C.—Four flamethrowers were attached to the 32d Infantry to burn caves and troop pockets in the regimental zone. Two of the caves are said to have opened into Jap army headquarters. Sergeant ____, using the hose attachment, fired ten caves. He was accompanied by an interpreter with a loudspeaker who tried to get the Japs to leave the caves. Only two were taken this way. The hose exploded twice during the operation. Sergeant ____ fired a load at caves along the beach and reported many suicides. Sergeant ____ fired two loads into a hill in which an infantry battalion commander reported 500 Japs holed up. With the help of Sergeant ____ and Corporal ____, the hill was completely reduced. Four flamethrowers were attached to the 1st Battalion, 184th Infantry, and mopped up TA 7757-PQ. Numerous caves were fired with many Jap casualties. One load was fired into a large crater near the company area. Nine Japs were killed when they charged the dismounted men from company headquarters section who were supporting the flamethrower. Eight other Japs, including one captain, were captured. The company expended 4,200 gallons of Napalm. Eight hundred sixty-eight Japs were killed.

23 June 1945: Company A.—Two flamethrowers were attached to the 1st Battalion, 382d Infantry, for mopping-up operations in the vicinity of Ozato. Six loads of fuel were fired with canefields as the main target. The flame proved very effective in flushing the Japs as the infantry stood by to kill or capture them. Late in the day one of these flamethrowers moved over to the escarpment east of Ozato and used the hose attachments on caves with good results. Four flamethrowers operated with the 381st Infantry, mopping up strong enemy resistance in Medeera. In one case the infantry blasted a hole in a courtyard wall; then a flamethrower pulled up and burned fifty-seven Japs who were hiding there.

Company B.—The 1st Platoon operated with the 6th Marine Division. Staff Sergeant ____ with three flamethrowers mopped up in TA 7456, 7256, exploding an ammunition dump and killing thirty Japs. The 2d Platoon, three flamethrowers, operated with the 1st Marine Division in TA 7660, 7560, 7661. Sixteen Japs were killed. Sergeant ____ from the 3d Platoon fired one load in TA 7559-Q.

Company C.—Five flamethrowers were attached to the 32d Infantry and two flamethrowers to the 1st Battalion, 184th Infantry. Sergeant ____ fired into four caves, killing twenty-three Japs. He also killed one with his pistol at the refueling point. Sergeant ____ reported to the infantry battalion commander and was told that 1,000 Japs were rounded up in a huge cavern. The approaches to this cavern had been mined, so the infantry removed them to permit the flamethrowers to approach. When interpreters failed to get more than a handful out by loudspeakers, Sergeant ____ fired one load into the main entrance. There was no estimate as to the number of Japs killed. One Marine patrol entered this cave and never came out. A second patrol entered, received casualties, and withdrew. Sergeant ____'s tank fired one load over a bluff on the shore and the wind blew the flame into caves underneath. Five huge explosions resulted.

Flame tanks were used in a variety of ways during the operation; new tactics were devised and older ones, worked out during the training period, were refined and modified. This was a new weapon, first tried in battle only a few weeks before on Iwo Jima, and flame-tank crews had no approved tactical doctrine to go by except a few preliminary reports from Iwo, reports from light-tank flamethrowers used on Saipan, and the translation of some German instructions for the use of an entirely different type of flame-throwing tank. The men learned fast. Canefields, brush, and wooded areas were effectively cleared, and flame was used exten-

sively for the flushing of the enemy from caves and the curious Okinawa stone tombs. The weapons were used for flaming the forward and reverse slopes of hills and escarpments, for clearing foxholes and bottle-shaped spiderholes dug in the earth. Flame was fired into the wind over cliffs, especially along the rugged coastline, allowing the wind to blow flame back into the cliff caves. Flame in quantity was used to burn villages, flushing Japs from the ruins of structures previously blasted with bombs and artillery. The flame-tank hose extension was used time and again in reaching pockets of Japs which could not be flamed directly by the flamethrower tanks.

During its seventy-five days of almost continuous action, the 713th Flamethrower Tank Battalion was officially credited with killing 4,788 Japs and capturing forty-nine, a record which would probably be doubled if credit were given for the other thousands of Japs who were flushed out of their underground caves and killed by the supporting infantry. Our losses were seven killed and sixty wounded, a truly remarkable record of combat achievement, when it is considered that all tanks were inoperative for over two weeks due to the torrential rains and resulting mud which immobilized all tanks, and further that the 713th was employed only on call missions.

The Okinawa operation again emphasized the necessity of tank-infantry training. As the flamethrower tank was a new weapon, its capabilities and limitations were not known or understood at the time preliminary training was conducted. Daily changes in tactics were made to correct deficiencies, and by the close of the operation the tank-infantry team was operating near the peak of combat efficiency.

A final comment by the flamethrower battalion follows:

"This battalion killed a large number of the enemy on the operation and destroyed a great deal of his equipment. However, the true value of the weapon cannot be indicated by these figures. Its value lies in its ability to drive the Jap out of his prepared positions into the open to be killed by supporting troops. Experience has proved that the Jap, regardless of his fanatical intentions to hold his ground and die for the Emperor, will not remain in his hole when flame is brought to bear on him, but he will make every effort to get out and away from the flame."

The infantry had high praise for the flamethrower tanks in the Okinawa campaign. The following statement in the 7th Infantry Division Operations Report on the Ryukyus campaign is typical: "In this campaign flamethrower tanks were outstandingly successful and of the greatest value. It is recommended that one company of flamethrower tanks be incorporated as an integral part of the tank battalion attached to an infantry division.

"Hose extensions to the tank-mounted flamethrowers proved to be a success in driving the enemy out of caves and dugouts hidden in inaccessible locations. It is recommended that 150 feet of hose in fifty-foot sections be adopted as standard equipment for each armored flamethrower company."

That the Japanese found our flamethrower tanks a serious threat is borne out by the following statement of the Signal Officer of the 11th Battalion, 63d Brigade, 62d Division, captured on Okinawa: "An attack by flamethrowing tanks is the thing most feared by Japanese troops."

The outook for national security in this country is in direct ratio to the interest of the individual American citizen, and I might say the women in particular, their attitude towards the man in uniform and to the purpose he serves. He must be as important in peace time as he is in war times. His uniform must be a badge of honorable service. Both the soldier and the public must promote respect for it.

—Lieutenant General Raymond S. McLain

Cellular Organization

LIEUTENANT COLONEL THOMAS H. MAGNESS, JR., *Chemical Warfare Service*
Instructor, Command and General Staff School

A tool in the hands of the commander that should be employed more and more each day is the cellular organizations listed in the "500 series tables." With VE and VJ-days past, the need for specialists to perform various services or housekeeping jobs will still be with the commander. But how can he justify retaining a large organization when there is a demand for demobilization? He must insure that his organization can render prompt and efficient service both within its organic capability and, at times, in addition to its capability. It is not justifiable to retain an entire unit for a special task when the unit cannot be fully and consistently employed.

Augmentation is the key to the problem. Augmentation is accomplished in either of two ways: first, by adding the required number of specialists (cellular unit) to an existing T/O unit, or second, by grouping together the specialists or specialist teams (cellular units) into a separate "service" unit and providing for the necessary administrative, mess, and command echelons, so that they can be self-contained and controlled. It is not necessary that specialists' teams of one technical service only (intrabranch) be combined to form this service unit. Whenever the occasion arises, teams from two or more technical services can be combined and administered as one composite service unit (interbranch).

Remembering a stock answer to many questions—that it all depends on the situation—the situation in this case provides the direct answer. The commander can select the particular teams he requires to perform his tasks, and he can therefore "tailor-make" an organization for the particular job or situation he may face. Composite service units, in addition to providing the right personnel, in the correct numbers for the commander, also permit the commander to have the grades and ratings commensurate with the job to be done. This enables rewards for merit to be made in accordance with the assigned tasks, in more cases than would be possible with a T/O unit, when meeting a "Special Situation." Consequently the morale of personnel does not suffer. Replacements can be requisitioned by MOS [Military Occupational Specialty] to fill vacancies and these replacements are assured of their ratings as soon as they are found qualified, in accordance with the promotion policy of the area in which they are stationed.

Where will these composite service units be employed? If not already employed in occupational areas, the situation now exists and the machinery is already available for setting up these composite service units in CIR 160 (1945). It is contemplated that a fixed number of combat troop units will be employed in occupational areas, so housekeeping and service units must be provided for these occupational troops. Inasmuch as many "special situations" will arise in the employment of the occupational troops, the use of the composite service units, made up of cellular teams to provide their particular services, will make for better services with an inherent economy of personnel.

It has been mentioned that the machinery for setting up these service units is already available. However, nothing has been said about the mechanics of organization. In many cases a composite service organization may, like the proverbial Topsy, "just grow up."

A suggested outline of procedure to be followed in setting up a composite service organization follows:

1. List on a separate work sheet the particular services to be furnished by each technical or administrative service (hereafter called service).

2. Select the particular teams which have the capabilities to furnish the necessary services from the pertinent "500 series tables."

WORK SHEET

Service Rendered	*Type Team*	*Officers*	*EM*	*Vehicles*
Subtotals				
Mess Team				
Auto Mech Team				
.....Headquarters				
Totals				

Designation

Chemical*

(Number) (Service) (Use) (Unit)

Activation Order Information:

(Number and type of teams)

*Chemical Warfare, Engineer, etc., or General.

3. Tentatively provide for each service an administrative headquarters such as platoon or company. An administrative headquarters for each service should be provided when two or more teams with a total of forty or more men are selected.

4. If the total for a service is more than forty and less than 100 men, a platoon headquarters is required. If over 100 men, a company headquarters may be utilized. Platoon headquarters are usually not necessary within a company comprised of teams of one service, as the team chiefs can each function as platoon leaders and each team may be considered as a platoon.

5. Provide from the pertinent "500 series tables" the required mess, transportation (mechanics), and command personnel, based on the total strength of the organization, to administer the unit and provide for internal housekeeping of the interbranch or intrabranch units organized as in 4 above.

6. Maintain intrabranch units as far as possible by organizing platoons, companies, or even battalions, if necessary.

7. Provide an interbranch headquarters to

administer the intrabranch units at the lowest echelon possible.

8. As a final check, could a T/O unit provide the necessary service with a lesser number of men than the unit organized from the "500 series teams"?

9. If a T/O unit is necessary and can be utilized, it may also be included under a branch immaterial headquarters for overall command and administrative functions together with units from the "500 series tables."

As an aid to the mechanics described in notes 1 to 9 above, the form (work sheet) shown on page 52 may be employed as a guide to organization.

A word about designation. Each unit will have a number as authorized by the War Department. Designation of separate units should cover the principal or most important service that the unit will render. In case there is no definite service rendered, the unit would be designated as the ___th ----------* Service (Plat) (Co) (Bn).
(Service)

Specifically how could these composite service organizations be employed? Supply points and maintenance units will be required to provide services to occupational troops to insure their well-being. General or branch depots will be located centrally to serve an occupational area. Composite service units can be efficiently utilized at these locations, as supply and maintenance factors will not be as high during occupational duties as they are during a campaign. The service to troops that will be necessary can be provided by a smaller number of personnel than by the T/O organization employed at present. It should be realized that the tonnages handled will be less, armament maintenance will approach zero, automotive maintenance will lessen, and chemical service will be nonexistent. Fixed medical installations will be necessary only for sickness and injuries, signal operations will be carried out by means of commercial facilities, engineering work will decrease as rehabilitation and construction are completed; but the Quartermaster will be engaged in his normal role and ordinarily in a slighter degree. The administrative services provided by the Adjutant General, Military Police, Finance, and Special Service organizations will still have important functions to perform in rendering to the occupational troops particular services which will aid in their welfare, morale, and general well-being.

By utilizing the teams provided by the "500 series tables," full service can be provided with a minimum number of specialists, and thereby assist in the early release for demobilization of personnel of T/O organizations that in many cases would be in excess of requirements.

* Chemical Warfare, Engineer, etc., or General.

Those who work hard with reasonable intelligence in any job will be the men who are sought after by those in charge of the job. Brilliancy of knowledge without hard work is of little use. Hard work, intelligently applied, even though not accompanied by unusual brilliancy, pays big dividends in getting any work done and it pays big dividends to the men who apply that hard work. They are the men who are relied upon in getting things done.

—Brigadier General L. B. Weeks
in *An Cosantóir* (Eire)

Task Force Signal Coordination and Integration

LIEUTENANT COLONEL CLARK H. MITCHELL, *Signal Corps*
Instructor, Command and General Staff School

Task Force Organization and Phases

THE success of task force operations, more than of any other type, depends on the degree of coordination between many different types of units, on the ability of the commander to control all his elements at any time, and on continuous dissemination of all pertinent information to all elements. This coordination, this high degree of control and wide dissemination of information, cannot be accomplished without a thoroughly effective signal system. The system, to be effective, must be well planned, properly implemented, and thoroughly understood by operators and users.

The object of this discussion is to indicate what troops, means, and agencies are available to a task force commander so that a general staff officer on such a command will be able to work intelligently with the signal officer in building up the signal plan and assisting in its execution. It is not intended to present the duties of signal officers, or details of a complete signal plan. It is only intended to impart an understanding of the part played by each general staff section in formulating its portion of the plan, so that the finished product will satisfy the requirements of that section and of the force as a whole.

A task force is, of course, organized for a particular operation or series of operations. It may consist of any or all of ground force, air force, or naval components, with necessary service elements to render logistical support. Its commander, ordinarily designated by the theater commanding general, is usually from the preponderant component, and the force takes its name from that component, i.e., naval task force; air task force. This discussion considers a ground task force transported by naval vessels and supported by naval and army air forces, since such a force requires the highest degree of coordination and integration of effort.

The organizations assigned a task force may be selected from troops available in a theater or specially detailed to a theater to meet a specific need for a special type unit or to add necessary general strength.

These units are, when practicable, staged in the same area and under complete control of the commander selected, but in some cases they are forced to stage in widely separated places, with consequent difficulty of control.

The phases of task force operations may include:

1. Preliminary Phase.—This phase starts with the decision of the Joint Chiefs of Staff. This decision is transmitted, for example, to the War Department, which sends a directive to the theater commander, stating in broad terms the objective to be gained, the approximate time of the operation, and other items which permit the theater staff to initiate its planning. The task force commander is appointed, and the theater plans, so far as completed, are transmitted to him. Steps are initiated by all levels to supply the necessary units not available in the theater.

2. Staging Phase.—During this phase the task force staff is set up and, while working in conjunction with the theater staff, assumes step-by-step the more detailed planning duties and the integration of the task force units. Troops are collected in staging areas and equipped. Training programs are set up and put into effect covering all phases of individual and organizational training in which troops must be proficient to insure success of the operation. This phase includes the movement of the troops from the staging areas to ports of embarkation and the loading aboard ship.

3. The Movement Phase.—In this phase the naval commander assumes complete command responsibility for the convoy, and is responsible for its movement, timely arrival, and protection.

4. Landing Phase.—This phase begins with the arrival at the objective and includes the

landing. In this phase the naval commander is usually in command of troops until landings have been completed. Air support is furnished by naval aviation with such assistance as may be rendered by Army Air Forces units based within striking distance. The beachhead is secured, and service units and supplies to support the final assault phase are landed.

5. Final Assault Phase.—The final objective is taken and control established over the area contemplated by the theater commander and designated to the task force commander. Air support is rendered in increasing proportion by AAF units as airdromes are captured or constructed and land-based aircraft are brought in.

6. Consolidation Phase.—The naval force, including its aviation, withdraws. All or any part of the army ground and air portions of the task force may be withdrawn, and, if advisable, replaced by other troops. Command reverts from the task force to the theater, which designates a garrison commander. Further service troops and supplies are brought in, and the objective area is organized for defense against counterattack, for mopping-up operations, and, in most cases, as a base for further task force operations.

Why the Signal Plan?

Signal planning throughout the various phases must be concurrent with operations planning. It must be, generally, more detailed and more complete than for operations by standard air, ground, and naval units. Factors which dictate special requirements in task force signal planning are:

a. Dissimilarity in signal equipment among the various components.

b. Variations in procedure among various components and units and lack of basic signal SOP.

c. Dissimilarity in organization.

d. Need for additional signal units, within provisional organizations and for special purposes inherent in task force operations.

e. Need for combined training.

The Signal Officer and G-3

Survey must be made of the equipment and personnel available, and the amount and kind of each necessary for the operation must be determined.

The force G-3 must be consulted as to preliminary operational plans, and the signal officer must keep informed as to developments and changes as they are introduced into the operational plans, and must alter his signal plans to meet new requirements and to accomplish the signal support required. Plans must include the systems to be established and channels to be operated, since these are used as a basis for equipment and personnel requirements. Additional units and individual specialties will be required, both to set up the provisional units formed with signal units suitable to their type and to furnish additional communication necessary for the close liaison required between and among the components. For example, G-3 may plan landings by small groups in advance of the main landing, as was done in the Leyte operations. These may have the mission of reporting the situation to the task force while it is still at some distance, or of seizing an air strip or island. A radio team must be organized and trained, and a long-range set, not organic to units below division level, must be supplied. In addition, if it is expected that this group will need contact with air, either for request missions or for intelligence, the right teams with the right radio equipment must be set up. G-3 having outlined the missions, the signal officer must estimate the troops required for the provisional signal unit, and these two, with G-1, must then work out from what source they can best be obtained. Maximum use must be made of units and individuals available. Transfers must be negotiated from theater units and among units assigned the task force in order that each signal unit approaches as nearly as possible the ideal of having each man qualified and competent in his own specialty. Requisitions may have to be made on the zone of the in-

terior for troops trained or qualified for training.

Here, again, G-3 enters the picture. Even presupposing a high state of training in the organization, operating teams, and individuals eventually acquired (usually an over-optimistic presumption), there still remains a huge amount of special training necessary to accustom signal operating personnel to work with and for new units with possibly new types of equipment. There may be, also, the need for special training under geographical and climatic conditions approximating those expected during the operation. In all this the G-3 must assist. He and the signal officer work together on training programs. He assigns training areas and schedules simultaneous and coordinated training periods in which signal personnel of all components work together. He approves and publishes SOI's [signal operations instructions], signal orders, and signal training directives prepared by the signal officer to promote uniform procedure and to control technical details. One set of publications, the CCBP series, meaning "Combined Communications Board Publications," has been issued by the Joint Chiefs of Staff and has done much to standardize procedure in our Ground Forces, Air Forces, and Navy, and with our British allies. But this is still subject to variations in interpretation among the different components, and so these variations must be eliminated by clarifying directives. Special channels and special procedures must be coordinated with G-3; they must then be prescribed, and the signal troops must have training in their use.

G-4 Helps

Special channels, particularly those established between different components of the task force, for liaison and command purposes, often require a supply of some special sort of equipment. This may be an item in tables of some components but not of others, or some item may be needed which is not commonly used by any but whose need is indicated by the type of this operation. Or it may be a case simply of adaptation of some common, standard item to make it more suitable for the coming operations, such as preliminary mounting of radio or radar sets for vehicular use. Whether it be special equipment or that regularly issued, it is G-4's province to see that it is provided, and the signal officer's to assist him with advice, recommendations, and reports on status and needs, both of signal supply and maintenance.

G-2 is Interested

During this preliminary phase the signal officer's contacts with G-2 concern mainly the formulation and issue of codes and of planning signal countermeasures. The codes include those issued by task force and higher headquarters and annexes used to supplement them. The countermeasures include security restrictions on use of signal equipment which must be put into effect immediately. During the planning phase everybody will want to communicate with everybody else. Reports, requests, and orders will clutter the channels between units in the same chain of command, between ground, naval, and air headquarters, and between tactical and service units which must work together. Security precautions should, if possible, prevent the enemy from noting the large increase in communication traffic from which he can deduce that something is impending, and in any case must prevent his intercepting and code-breaking our messages to deduce what it is. The use of radio should be prohibited if other means can be made to suffice. If used, effective codes must be issued and employed in strict accordance with signal security principles.

The codes are published in the task force SOI and include such brevity, authenticator, fire-control, and liaison codes as may be needed, plus such additions as a geographical appendix to already existing codes.

Any radio silence periods contemplated during the operations should be planned and ordered at this time so that the signal officer and the units can plan alternate means to be used when radio is forbidden. All of these measures are counterintelligence and the province of G-2, but in the special field

of signal counterintelligence he and the signal officer must work together like two arms of the same body.

During Training

Finally, the signal officer must arrange the facilities for communication within the task force during the training period. All staff officers, of all units in the force, will need and demand prompt service to other units and to supply installations serving the force. If the task force is being staged in the continental United States, these channels would be installed and operated by service personnel within the various unit areas, and with immediately adjacent ones. Communication between widely separated units would be by commercial facilities, telephone, teletype, and telegraph. In other countries, even should they be friendly and modern, we cannot expect the commercial development to approach ours in size or quality, and this communication must not only be planned by the signal officer but installed by signal troops. As it must be working during the preliminary phase, before the organization is complete, the only signal troops under task force control are those initially assigned, so maximum use must be made of existing theater channels and in some cases theater signal troops must be borrowed temporarily to reinforce those assigned the task force. Similarly, the only material and equipment for this system must be procured from stock immediately available.

During Movement

When the units are gathered in staging areas and embarked on the Movement Phase, the communications become the responsibility of the convoy commander, Navy project. We cannot assume that the task force signal officer would have no interest in the communication channels employed, nor the ability to influence them if he did. It is reasonable to expect that many last-minute details, minor changes in established directives, and reports called for and rendered will bulk up as a heavy traffic load between ships, particularly between headquarters ship and other commanders and between ships each of which carries part of the same unit. The Navy radio is the natural carrier for this traffic. But the Navy radio will frequently be silenced for security purposes, and even when operating must, of course, give preference to convoy control traffic, deferring Ground and Air Force traffic for later transmissions. One solution is signal lamps, operated ship-to-ship by Army personnel. The supply of the lamps, except some few which might be borrowed from the Navy, and the training of the signalers should have been included in the pre-embarkation phases. If it is done, such foresight will pay big dividends in accelerating communication among the units aboard, and probably also, good will with Navy commanders who will appreciate this lightening of the signal load on their already overtaxed facilities.

There must be a small Army message center and messenger organization on each ship to route messages from or to the ship's commander and other ships. The Navy personnel cannot be expected to perform this function even if they understand Army procedure and organization. Although these message center groups will be detailed from personnel assigned the ship by loading orders, their formation should not be left until experience indicates the necessity, but should be specified in G-3 instructions and ready to go when first needed.

Radio During Landing

The landing is the phase requiring the most complete signal planning, coordination, and execution, because signal communication must rely almost entirely on one means, radio, and because of the numerous nets thus involved, the speed of action and tendency toward disorganization, and the necessity for three-way coordination between Air, Ground, and Navy. These nets will be of several types, the total number probably depending not so much on the amount of equipment available, the size of the force, or the wishes of the commanders, but more on the number of frequency channels that God has provided in the ether and that the enemy cannot or does not want to interfere on. In

general, there are command nets, Army, Navy, ship-to-ship, ship-to-shore, and point-to-point ashore. There are control nets, to handle the landing craft and direct air strikes from afloat or aloft. Then there are several types of nets used for liaison and mutual support.

For purposes of this discussion, it is necessary only to consider three of these nets which are used for interservice communication. First, there are the nets used with beach and shore parties. Beach parties are ordinarily made up of naval personnel, and their job is to direct boat traffic from vessels to shore. Shore parties are typically Army, usually engineers who have charge of the unloading and disposition of loads as soon as landed, as well as the general organization of the shore installations. These parties usually work together in teams, but both need radio communication with the ships. In addition, the beach parties need channels to the small boats, and the shore parties need either radio or wire laterally to their dumps and laterally to other parties.

Thereafter we also find the Naval Gunfire Support nets over which the landing troops request and adjust naval gunfire by using ground artillery observers. Finally, there are the Air Support Nets by which ground troops ashore may request air missions.

JASCO

The shore end of all these nets is operated by a special combined unit of signal personnel from Air, Ground, and Navy, called the Joint Assault Signal Company (JASCO), which formerly was extemporized by task forces but is now on T/O's. This unit provides enough of each type of signal party for most operations, and can be added to by additional parties when necessary. These companies are assigned to each sub-force of a task force. Such a company has a headquarters platoon and three sections, each corresponding to one of the three radio nets just mentioned.

Shore and Beach Parties

The battalion shore and beach party section is composed of shore parties, Army Ground Force, and beach parties of Navy personnel. It establishes the shore end of command channels from commanders still afloat, as well as the necessary channels for beach control of landing craft. For the shore-to-ship communication, use is made of a portable, medium-range set, working either voice or key as distance dictates. The beach party communications sections use the handset type radio, the handy-talky, a short-range set. They supplement their radio communication by signal lamps, semaphore flags, and stationary flags and lights. Maximum use is made of these visual means for security reasons and to clear the overloaded radio channels. This section also has wire equipment and personnel. It installs a wire net complete with switchboards to connect all shore installations. Combat troops moving inland make use of this net to communicate with shore parties and, by radio relay, with waterborne units and commanders. In fact, the first wire installation on each landing beach will probably be a shore party telephone from which an assault infantry battalion will lay a line as it progresses inland. From that, the shore party wire net may develop into an elaborate system giving telephone service to all elements of the task force as they come ashore.

Fire Control

The shore fire-control section is composed of teams, each with a field artillery officer in charge, one enlisted observer, two radio operators, and two linemen. This section also has a naval officer attached to assist the artillery observers. It has handy-talky radio and telephone with wire. Its function is to furnish forward observation for naval fires in support of the landing. It does this either by direct radio communication to the directing ship or by using its wire to a radio relay on the beach.

Air Liaison

The air liaison section is composed of parties organized similarly to the fire-control parties but omitting the naval assistance and the wire men. It enters usually the Sup-

port Air Request Net to allow the ground troops to request air missions and to pass information to the controller. These parties ordinarily request missions through this controller and have no direct communication with aircraft in flight. However, the small sets may be used for that purpose, as they will operate in the frequency band of all HF [high frequency] airplane sets.

In the exceptional case where such communication is necessary with aircraft equipped only with VHF [very high frequency] radio, one such radio is furnished and installed in a half-track which will relay the messages from any of the air liaison parties.

Both the shore parties and the air liaison parties are equipped with panels for ground-air signaling. Panels are operated by radio operators as an additional duty.

Both fire-control and air liaison parties are assigned to landing force units as plans indicate they are required, and land with those units. It can be expected that one will be with each battalion landing team, one with each regimental combat team, and one or more with each division. The air liaison party, with its two radios, may, in addition to its primary function of requesting missions, also prove a fruitful source of information to the unit to which it is attached by using the second radio to monitor a net usually established by Naval Air Force for controlling their aircraft by an airborne coordinator. In several operations this has turned out to be the best and also the only source of information on activities up front. These parties of JASCO stay with their ground units as long as they can be of assistance.

The fire-control parties remain until the ground troops have passed out of range of naval gunfire, or until their field artillery has been landed and has taken over, making further such support unnecessary. The air liaison parties stay with the ground units until Army Air Forces units can take over close-support missions from the Navy and until the necessary tactical control centers have been set up ashore.

Signals for Ground Troops

Ground organizations, as they land, usually bring their signal units ashore in one of the early moves preceding, if practicable, the headquarters of the unit itself. A section of the battalion signal platoon will come ashore with the assault companies, set up a forward message center and radio, and send wire personnel forward, laying wire as they go. Similarly, signal sections from the regiment will go ashore in advance of the headquarters itself. Every effort is made to establish such a signal system for each unit so that, as its headquarters comes ashore, it immediately has facilities for command and information. The success of this sequence will depend on how well G-4, the transport quartermasters, and the signal officer have worked out the loading plan for signal equipment. Several signal units have landed when their services were badly needed, and rendered very poor service because their equipment was in the bottom of the hold or under medium tanks. Equipment to be used in the assault phase should not only be in proper unloading location but accessible so that it can be serviced during the movement and ready for use on arrival. With signal as with other equipment, loading must be so planned that the loss of one or a few ships will not leave the task force completely lacking in any one item.

Ships carrying a headquarters comparable to a division will have military personnel not participating in the landing phase, which will remain on board as long as there exists a necessity for communication with the landing force.

With the divisions themselves will go their division signal companies; other signal units, some with the initial movement and others with later convoys, will arrive to assist in the consolidation and garrison phase. Air-warning units, either T/O companies or task force teams picked from the variable air-warning organizations, should be landed as soon as equipment can be put

ashore and transportation and sites are available. As the force ashore increases, it will need increased signal facilities and the organizations to install and operate them. Corps will each include a signal battalion to install field wire and to operate all means. The army will bring a signal construction battalion for communication, a signal repair company for third echelon maintenance, and a signal depot company for fourth echelon. Miscellaneous units that will be brought in either as units or by detachments, as needed, will be a photo company, a pigeon company, a signal radio intelligence company and a SIAM (a signal information and monitoring company), and radar maintenance units.

As the consolidation progresses, there will be a need for communication zone signal units. These may include the standard base depot group, furnishing high-echelon signal supply and maintenance, and various groups selected from the teams available in the signal service organization. These organizations will furnish the communications for the area secured by the current task force, and the signal supplies storage and recovery needed for further operations.

The make-up of a task force cannot be standardized. Neither can the Signal Plan. Each staff member, of each unit, of each component, must set up the requirements for his section and demand the signal service which it needs. Each staff member must then contribute toward the formulation and the accomplishment of a Signal Plan which will support the operation successfully. The difficulty of maintaining effective communication is second only to its necessity, and can be achieved only by overall integration and complete coordination at all levels.

Supplies Air-Dropped to Allied Prisoners

From the *Quartermaster Review* September-October 1945.

ON 28 August 1945 a mercy fleet of 125 superfortresses, in their second "relief bombing" of the week, dropped more than 875,000 pounds of food, clothing, and medical supplies—including canned beer—into sixty Allied prisoner-of-war camps on Honshu and Kyushu. The B-29's parachuted 50-gallon oil drums into eleven camps in the Tokyo area, twelve near Fukuoka, nine in the Kobe-Osaka area, eight near Sendai, and six near Hiroshima. The oil drums contained soup, cocoa, C and K rations, fruit, candy, vitamin tablets, shoelaces, sewing kits, uniforms, soap, toothpaste, razor blades, and other toilet articles. Each superfortress carried 7,000 pounds of supplies. In some cases only half a load was required for the prison camp. Each drop, however, included enough medical supplies to last twelve hundred men thirty days.

G-3 Section in Combat

Prepared by members of the G-3 Section, 76th Infantry Division.

FROM G-3 of an infantry division in training to G-3 of an infantry division in combat is a longer step than one would think. As the Colonel sits in his comfortable office at Camp Blank with his trusty assistant at his side and watches his three industrious liaison officers diligently plying their pencils, he smiles the satisfied smile of a man who observes his own handiwork and finds it good. Later, as his division prepares to bundle its last men aboard the transport, he takes stock again. How smoothly everything has gone! He smiles once more. The assistant he has relied on, the liaison officers he has trusted have yet to fail him and he is sure they will not. He is confident of the powers of his section. As he steps up onto the gangplank, however, certain disquieting questions enter his mind—questions that every G-3 should ask himself and answer honestly before he can be sure that he is ready to operate in combat. They are questions about the organization and adequacy of his own section, a matter he has always taken for granted in garrison and even on maneuvers. Yet now, as he approaches the final phase of his journey to war, he asks himself such questions as these: With all the duties I have to perform (planning, operations, issuance of directives and supervision of their execution, keeping up on the situation, reports, dissemination of operational information, staff conferences and visits), have I enough capable help so that I can forget about the current situation for long periods and devote myself to thinking out the next step? Have I enough trained assistants so that I can sleep and eat occasionally and be at my most efficient best when most needed? Am I sure they can operate without me and that we can function satisfactorily in two separate echelons and multi-varied shifts? Am I sure that even if we lose men through accident, illness, or hostile action we will still have sufficient trained and competent men to carry on without a pause? Have I trained enough liaison officers to meet the requirements for liaison?

It cannot be re-emphasized too strongly that these questions which the Colonel has asked himself should be the close concern of every G-3 as he nears combat. The G-3 Section is a continuously functioning machine. No part can be indispensable. Its parts must be to a high degree interchangeable, with a good supply of spares, and the machine must be able to function smoothly even when half is missing! If a G-3 cannot successfully try his section by these standards, he will be found wanting in the field.

Let us examine for a moment the section as prescribed by Tables of Organization. The following officer personnel is allotted specifically to the section:

1 Lieutenant Colonel, G-3

1 Major, Asst G-3

1 Major, Asst G-3, Information and Education

1 Major, Asst G-3, Ground Liaison

The following officer personnel not allotted specifically to the section is usually attached to it:

3 Captains, Branch Immaterial, Liaison Officers.

The division commander or his assistant may or may not release aides for work in the G-3 Section, but such release is not to be relied upon nor can it be considered in calculations.

In a combat situation, the three captains, liaison officers, are intended for dispatch to higher and adjacent headquarters, and therefore cannot be depended upon for work within the section. Furthermore, as amply illustrated by combat experiences, circumstances arise with monotonous regularity wherein, due to the multiplicity of forces engaged or the inadequacy of signal communications, as many as five or six liaison officers are needed. It can readily be seen that the three allotted liaison officers will seldom if ever graze in their home pastures and are lost to G-3 as assistants.

The Assistant G-3 Ground Liaison and the Assistant G-3 Information and Education have special functions which it is their primary duty to perform. They are free to assist G-3 in planning and operations only on a part-time basis. They may be given routine or scheduled tasks, however, to discharge in addition to their other duties—for example: periodic reports, after-action reports, and administrative paperwork.

This leaves G-3 and his assistants as the *only full-time officer personnel* available to perform and supervise the multiple duties listed earlier. Furthermore, if these officers split into the shifts necessary for twenty-four hour operation or divide into two echelons for movement, *one man alone* is left to perform or supervise the full burden of duties. This situation is so manifestly foolish as to be incredible. However, it is exactly as provided for in the Tables of Organization (T/O).

A similar situation prevails in regard to allotment of enlisted men. The following personnel are usually earmarked for the G-3 Section:

1 Master Sergeant, Chief Clerk
1 Master Sergeant, Operations
1 Staff Sergeant, Operations
1 Sergeant, Operations
2 Rating T/3, T/4, or T/5
1 Pfc, Draftsman
1 Pfc, Stenographer

8 Total

Duties to be performed include: journal-keeping, dissemination, posting of the situation map (all full-time jobs); filing; reproduction; typing of reports, messages, directives, stenography, etc. These duties are plainly too numerous for the personnel available, and, while the eight men can be conveniently broken down into two equal shifts or echelons, neither subdivision is sufficient in strength to discharge the duties by itself and the overall strength is considerably short of that necessary for twenty-four hour operation.

The answer to our Colonel's self-questionings should now be quite apparent, assuming, of course, that his section was a strictly T/O one. His first query was whether or not he would have sufficient help with all the duties he was to perform. The answer is plainly—no. Except for part-time assistance from the Information and Education and Ground Liaison Officers, he could rely on no aid except from his Assistant G-3 with whom he was at the same time forced to split a shift. His second query was whether or not he could be freed from the pressure of the current situation for essential long-range planning. Obviously not—for if there were not enough personnel to assist him, there could not be enongh to free him. His third query was whether his section could operate on a twenty-four hour basis. Again the answer is no, as such a shift would leave one man on duty with far too large an accumulation of duties. His fourth query was whether or not he would be able to operate in spite of normal "wear and tear" personnel losses. Scarcely able to operate on the existing basis, he would find operation more than impossible on any reduced scale. His last query as to the sufficiency of liaison officers must also be answered in the negative. During the First-Third Army drive toward Dresden, when infantry divisions followed armored divisions abreast, liaison was necessary to two flank armored divisions, two flank infantry divisions, and one armored division to front in zone. In addition, two liaison officers were required by corps due to the great distances between corps and division headquarters. Such a situation can occur frequently in mobile warfare and sufficient liaison personnel must be available to meet it.

These questions reveal the main defects of the T/O. Summed up, they may be stated as follows:

a. T/O allots insufficient personnel (both officers and enlisted men) for the task at hand.

b. As established by T/O, the G-3 Section cannot successfully be organized to free G-3 and his assistant from attention to the current situation for the detailed advance planning essential to success in combat.

c. T/O does not provide necessary officers

and enlisted men for operations on a shift basis or for operation in two echelons.

d. T/O does not provide sufficient liaison officers to meet actual liaison needs.

Having described the flaws of T/O let us turn now to the positive aspect of the subject and examine the solution to the existing problem. The recommended organization for G-3 Section infantry division whch is described below and illustrated on the accompanying chart (pages 64-65) was evolved by an infantry division under the stress of actual campaigning. The operation of this system has been outstandingly successful and has materially contributed through its simplicity and efficiency to the battlefield victories of the division. It is hoped that its publication will be of maximum assistance to other organizations and that it will forestall many of the problems which confront organizations entering combat. It is further hoped that the sectional organization described below will be utilized as a basis for a new and rational allotment of personnel to the G-3 Section of infantry division headquarters.

The following principles were considered in developing the organizational plan:

1. As a rule, G-3 must be freed from all but pressing current details for long-range planning.

2. In order to be so freed, G-3 must have assistants qualified to assume the burden of operations.

3. There must be a group in the section where the current situation reports converge and originate.

4. The situation recording group must be kept separate from the planning group, yet be immediately available for reference.

5. Additional liaison personnel must be provided to meet actual needs.

6. Enlisted men should be organized into a clerical and a drafting section, coordinated by a chief clerk, thus facilitating control and increasing efficiency.

In the paragraphs below is described in detail the proposed organization of the G-3 Section. The accompanying chart provides a schematic illustration.

A. Organization of Officer Personnel of G-3 Section

1. Officer personnel of the section is divided into three subsections:

a. Planning and Operations—to include G-3 and his assistants.

b. Situation and Reports—to include Duty Officers and their assistants.

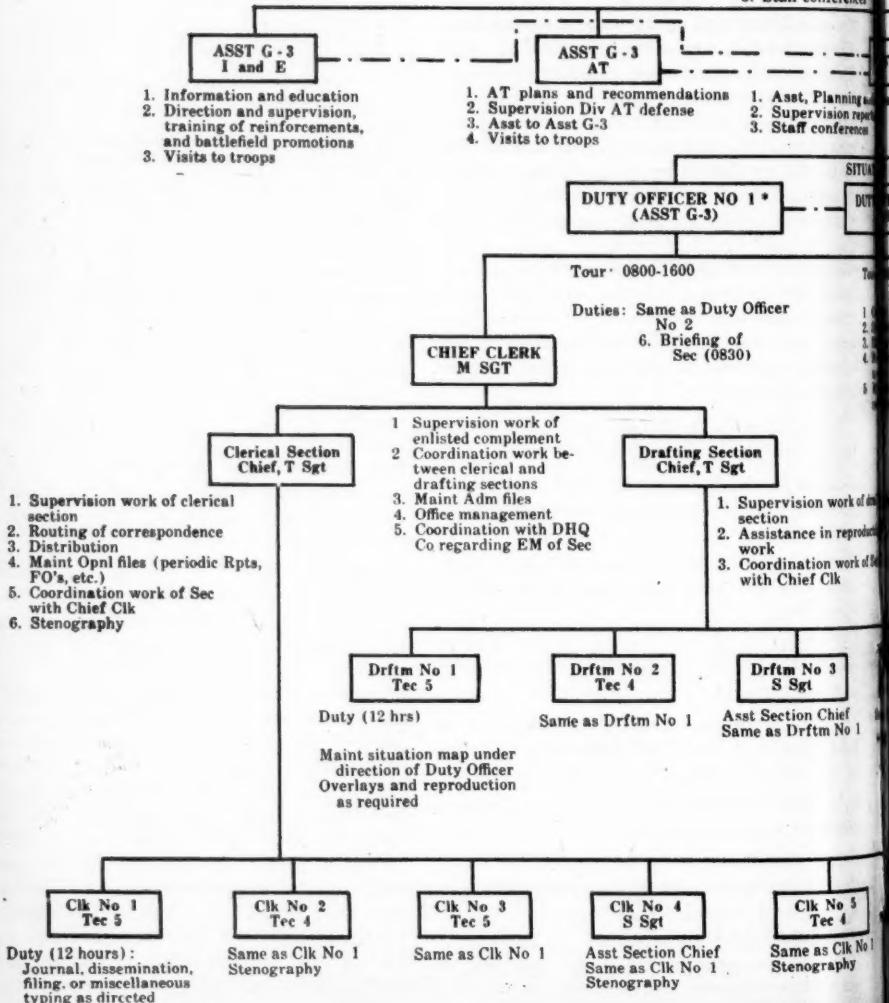
c. Liaison—to include a minimum of four Liaison Officers.

2. Assistant G-3 is responsible to the G-3 for the smooth and efficient operation of the entire section and has direct supervision over all except his own subsection.

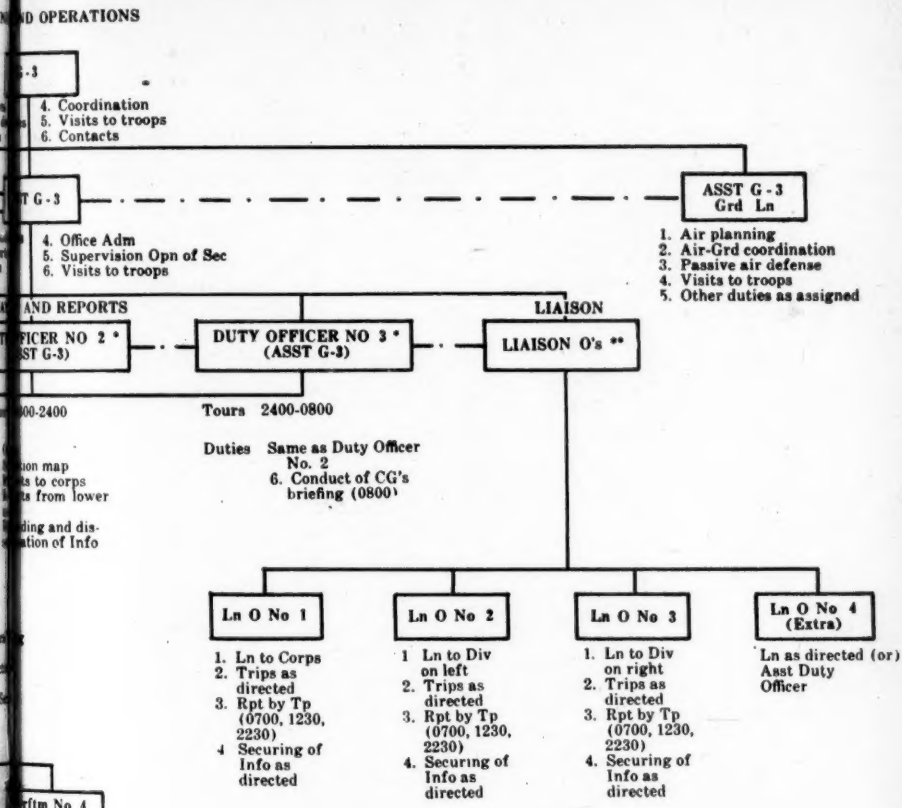
3. Under the direction of G-3, the Planning and Operations Subsection bases its plans, recommendations, and preparation of directives on the developing situation as reported by the Situation and Reports Subsection and on the information from higher and adjacent headquarters as outlined in orders and messages or reported by Liaison Officers. G-3 or his assistants participate in staff conferences and execute staff visits. In addition to their specialties, assistants to the G-3 perform other duties as assigned (see chart). These subsidiary duties are rotated from time to time.

4. In the Situation and Reports Subsection, the Duty Officer must be prepared at all times to give a clear, accurate, and complete picture of the situation. He keeps an up-to-date situation map, sees that all incoming operational information is recorded in the section journal and disseminated to interested commanders and staff officers. He insures that complete reports on the situation are given to higher headquarters as such headquarters may prescribe. He furnishes to lower units of the division all information in his possession which may assist them in the accomplishment of their mission. Duty Officer No. 3 briefs the Commanding General and the division staff each morning on the developments of the situation during the preceding twenty-four hours; Duty

CHART TO SHOW PROPOSED [illegible] OF THE INFANT[illegible]



TIONAL ORGANIZATION FOR G-3 SECTION VISION IN ACTIVE COMBAT



* Duty Officers rotate every two weeks on shifts. Each Duty Officer is on duty eight hours but should spend at least two hours orienting himself prior to assumption of duties. In situations where extra Liaison Officer and Aide No 2 (see note below) are not available or where additional help is needed, Duty Officers 1 and 3 stay on tour four additional hours and Duty Officer 2 starts tour four hours earlier. At hours other than those of his tour, Duty Officer is available for other assignments, visits to troops, etc.

** Due to frequent need for available extra liaison officers, one is provided above. When not needed for liaison, this officer assists Duty Officers Nos 1 and 2 as needed. In addition, Aide No 2 to CG or ACG (if not required by CG or ACG) may be used to assist Duty Officers Nos 1 and 2 as needed. Using extra liaison officer and Aide No 2, the section may split into two echelons and still maintain maximum operational efficiency. (If necessary, in a rapidly-moving situation, the two echelons may leapfrog each other. Extra liaison officer or Aide No 2 may be used to supplement liaison to subordinate units in situations where other means of communication are inadequate.

Officer No. 1 briefs the section officers and enlisted men at the beginning of the day.

5. It is the duty of the Liaison Officers to procure and communicate in a timely manner all information desired by the Planning and Operations and/or Situation and Reports Subsection and all information desired by other general and special staff sections of division headquarters. Extra Liaison Officers act as assistant Duty Officers when not performing their primary mission of liaison.

6. On the basis of organization shown above, it is recommended that the G-3 Section, Headquarters Infantry Division, be allotted by T/O the following officer personnel:

a. 1 Colonel, G-3

b. 1 Lieutenant Colonel, Asst G-3.

c. 1 Major, Asst G-3, Operations, Antitank Specialist

d. 1 Major, Asst G-3, Information and Education

e. 1 Major, Asst G-3, Operations, Ground Liaison

f. 3 Captains, Asst G-3, Operations

g. 4 Captains, Liaison.

Such an allotment permits efficient operation in shifts or in two echelons especially when Liaison Officer No. 4 is working as Assistant Duty Officer (or if Aide No. 2 to the Commanding General or Assistant Commanding General is made available for work with G-3 Section as Assistant Duty Officer). If necessary in a rapidly moving situation, the two echelons may even leapfrog each other, one officer being sent forward from the stationary echelon to reach the displacing echelon as it arrives at its forward destination and present it with the latest developments of the situation.

B. Organization of Enlisted Complement

7. To support the reorganization recommended for officer personnel of the section, changes must be made in the organization and composition of the enlisted complement of the G-3 Section.

8. The enlisted complement is subdivided into a Clerical Section and a Drafting Section, both supervised by the Chief Clerk.

9. In addition to supervision of the enlisted complement, the Chief Clerk is charged with coordination of work between Clerical and Drafting Sections. He maintains the administrative files and supervises office maintenance. He coordinates with division headquarters company on all matters pertaining to the enlisted men under him. It is his prime responsibility always to insure that qualified enlisted men are at hand to perform the required work.

10. The Clerical Section is headed by a Clerical Section Chief who oversees its work, routes correspondence through the office, supervises distribution, maintains operational files (Periodic Reports, Field Orders and Messages, Operational Instructions). There must be sufficient clerical personnel on hand at all times to keep the section journal, disseminate operational information, and prepare reports and directives for reproduction, and the Clerical Section Chief is responsible to the Chief Clerk that the required clerks are on duty. During combat operations at least two clerks—one for dissemination and one to keep the journal—must be on duty at the Duty Officer's elbow continually. A third clerk should be available for preparation of messages, directives, and other written communications.

11. The Drafting Section is headed by the Drafting Section Chief who oversees its operation and assists in the reproduction work. There must be sufficient drafting personnel on hand at all times to maintain the situation map, and to execute required reproduction of reports and directives. The Drafting Section Chief is responsible to the Chief Clerk that the required draftsmen are on duty. During combat operations at least two draftsmen—one for the situation map and one for reproduction of reports, messages, etc.—must be on duty at the Duty Officer's elbow continually. A third draftsman is necessary when such reports and messages must be reproduced concurrently with a directive.

12. On the basis of organization indicated above it is recommended that allowance be made in a subsequent Table of Organization and Equipment, Headquarters Infantry Division, for assignment of enlisted men to the G-3 Section as follows:

a. 1 Master Sergeant—Chief Clerk.

b. 1 Technical Sergeant—Chief of Clerical Section (stenographer-typist).

c. 1 Technical Sergeant—Chief of Drafting Section.

d. 1 Staff Sergeant—Assistant Chief of Clerical Section (stenographer-typist).

e. 1 Staff Sergeant—Assistant Chief of Drafting Section.

f. 2 Tec 4—Draftsmen.

g. 2 Tec 4—Clerk, stenographer-typists.

h. 2 Tec 5—Clerk, typist.

i. 1 Tec 5—Draftsman.

j. 1 Private—Clerk-typist.

NOTE: Enlisted men presently assigned to Information and Education and Ground Liaison Subsections are adequate in number and are not included in reckoning above, as they are occupied primarily with duties of their own subsections.

13. This allotment of personnel permits displacement of the section by echelon, at the same time retaining operational efficiency maximum in each section. During such displacement, the Drafting and Clerical Section Chiefs are split from their Assistants.

C. Transportation Required for G-3 Section.

14. The following considerations govern recommendations for allotment of transportation to the G-3 Section when organized as outlined in the foregoing paragraphs.

a. The section must be capable of operating in two effective echelons. Great distance between successive command posts in rapidly moving situations prohibits shuttling.

b. All liaison officers must be mobile.

c. Transportation must be immediately available to G-3 and Assistants in event that control of critical phases of operation necessitates staff visits.

15. Proposed allotment of vehicles:

Vehicle	*Quantity*	*Assigned to*
Truck, ¾-ton, C & R	1	G-3
Truck, ¼-ton, w/Tlr ¼-ton	1	Asst G-3
Truck, ¼-ton, w/o Tlr	1	AT O
Truck, ¼-ton, w/Tlr ¼-ton	1	I & E O
Truck, ¼-ton, w/o Tlr	1	Grd Ln O
Truck, ¼-ton, w/o Tlr	1	Ea Ln O (total of 4)
Truck, 2½-ton, Cargo	2	Transportation EM & Sec. Equipment
Tlr 1-ton	1	

This allotment of transportation should be made a part of authorized allowances and specifically designated for the G-3 Section. Only in this way can the movement of the Section in two echelons be insured and provide for continuous operation.

Combat experience proves the necessity for a T/O revision based on a thoroughly renovated concept of how G-3 must operate. Much grief and many costly errors would have been avoided in the past if the T/O had provided an adequate combat G-3 Section. The system which suffices in garrison fails utterly in the field.

Organized in the manner outlined in the paragraphs above, the G-3 Section functions smoothly, continuously, and effectively. This plan offers a sound and rational basis for a sorely needed change. It has weathered the severest trials. Combat-evolved by an infantry division, it is offered as a solution for a problem requiring urgent attention.

Ship Losses

From a release by War Department Bureau of Public Relations Press Branch.

THE war against Japan cost the Army a total of 200,058 ship tons of cargo lost at sea—the equivalent of twenty full loaded Liberty ships—in thirty-one vessels sunk and two vessels damaged while en route from the United States to the Pacific, Alaska, and India theaters.

Army cargo shipped to these areas in the forty-four months of the war totalled 43,520,000 ship tons. Those supplies lost at sea, therefore, represented only 0.46 percent of the total amount shipped. This means that for each 10,000 ship tons of cargo sent from the United States to the Pacific, forty-six were lost at sea.

When losses in the Pacific are added to the previously announced 537,656 ship tons of cargo lost on outbound moves from the United States to the European, Mediterranean, Middle East, North and South Atlantic, and Latin American areas, a total war loss of outbound Army cargo at sea of 737,714 ship tons is obtained.

Since the total Army cargo exports from December 1941 through July 1945 amount to 119,169,000 ship tons, the percentage loss for shipments to all overseas theaters is 0.62, or a loss rate of sixty-two out of each 10,000 ship tons exported.

In the majority of cases, loss of Army cargo was caused by enemy action. Of the thirty-one vessels sunk in the Pacific, eighteen were sunk by submarine action, air attack, or mines. Eleven others were lost because of fire, going aground, collision, or explosion. Two are listed as overdue.

During the European war, 105 vessels carrying Army cargo on outbound moves from the United States were sunk. Ten others were damaged. Of these, seventy-four vessels were sunk or damaged by submarines, six by mines, eight by bombings, and four by unknown causes. Fifteen vessels were involved in collisions, two in explosions, and six were lost in storms or went aground.

Japanese Artillery in Burma

LIEUTENANT COLONEL EARLE E. GARRISON, *Field Artillery*
Instructor, Command and General Staff School

(Digested at the Command and General Staff School from official reports on Burma operations.)

THE special circumstances of the operations in Burma are significant only as to jungle campaigns, but the underlying capabilities and technique of Japanese artillery, as evidenced in Burma, seem to indicate certain fundamentals of employment.

That the Japanese in this theater had a real respect for Allied artillery was evidenced by their care to conceal dispositions and avoid opening fire, even with rifles and machine guns, except at specific targets for primary purposes of attack or defense. Targets of opportunity were not ordinarily subjected to fire of any proportions, or even subjected to annoyance from the Japanese artillery. Often Allied vehicles traveled without hindrance within range of mortar and rifle fire. In fact, on many occasions, groups of Allied observers sat in a "grandstand," as it were, and watched Allied attacks under conditions permitting very accurate impressions as to Japanese capabilities. Consequently, a large amount of reliable information was gathered as to Japanese artillery tactics and technique in this theater.

The transport of Japanese artillery weapons in Burma involved both very primitive and very modern methods. With light artillery, the enemy appeared to use any form of transport available at the moment. Terrain, even of the most difficult type, seldom prevented his movement. At various times he was known to have transported light artillery pieces by man-pack, horse, mule, elephant, boat, truck, and tractor. He was resourceful, and might use any of such methods. His movement on roads was generally slow because of lack of mechanical equipment. However, in difficult terrain he was capable of incredible speed under supremely adverse conditions.

His 105-mm gun and 150-mm howitzer were normally towed by a full-track Diesel-engined high-speed vehicle. Captured models of this tractor indicated exceptionally fine performance. When roads existed, therefore, he could expect to move his medium equipment rapidly.

In practically all cases, personnel marched on foot. Few trucks carrying personnel were observed in the forward area.

Japanese light artillery positions, normally well forward, were sited for maximum protection and for the accomplishment of a single task such as firing on a road junction or on a defended position. Fields of fire were restricted in many cases to approximately fifteen degrees. Favorite positions were on hill crests or in deep mullahs [gullies]. After firing from the crest, the weapon would be lowered down the reverse slope for protection. When positions were on the forward slope, strong fortifications were built for protection, with usually a sacrifice of the field of fire.

Medium gun positions were usually widely-separated single-gun emplacements, sited in depth. For example, two guns might be sited close together, with two others 500 to 1,000 yards to the rear. Their range was used to the fullest, to keep out of range of Allied counterbattery. Japanese guns were located to bring fire in support of their infantry, but normally not into Allied rear areas.

The Japanese used alternate positions extensively. They fired one mission and then moved immediately to another position or into a protected area. They sometimes abandoned a position for a week or more, and then came back to it.

Their air defense was passive. No evidence was found of antiaircraft guns sited for protection of artillery positions, but of course such a practice may none the less have existed.

For fire-control communication, the Japanese used any means which were readily available. Where guns were located well forward on ridges, voice was used from close observation posts. Forward observers were thought to have used either wire or radio and, in many cases, visual signals. Prisoners reported the use of runners. The slowness of Japanese readjustments indicated that this might well be true. One mountain regiment had no radios, and used wire exclusively. The radios found were believed to belong to medium regiments.

Forward observers operated boldly, often well in advance of their forward positions, relying principally on mobility for protection. They adjusted fire from observation posts in the normal manner, using BC telescopes, aiming circles, range finders, and field glasses. Air observation posts were never used. The normal method of bracketing was used. An adjustment appeared to be considered correct after five or six rounds. At 1,000 to 3,000 yards the adjustments appeared to be accurate. However, adjustments were extremely slow, in some cases taking twenty to thirty minutes. This was believed probably due to shortage of ammunition, which undoubtedly restricted adjustments and the number of rounds used in each.

It seemed doubtful if the Japanese made extensive use of the normal methods of unobserved fire. Artillery maps of 1/25,000 scale were captured, however, which possibly indicated some use of such methods. There was no evidence of artillery survey during operations. Although it was known that the Japanese had units comparable to an observation battalion, no evidence of the presence of such a unit was found in Burma. Range tables and computers for applying weather corrections to firing data were captured, but no equipment for determining these corrections was found. However, it was believed that the Japanese were capable of accurate unobserved fire, and that with the use of increased medium artillery he would attempt to perfect its use.

In the Japanese Army, the infantry was known to be expected to be capable of victory without the assistance of other arms. As a general doctrine, the presence of supporting arms was considered what might be called a luxury, and not to be counted upon for decisive support. All tactics were therefore predicated upon the superiority of the infantryman. The infantry were given first choice of personnel, which naturally would result in other arms having troops inferior in ability to the infantry. The Japanese, furthermore, evidently did not consider that artillery strength, in the proportions normally found in other modern armies, was required for fighting in terrain like that in Burma, since the effectiveness of highly-mechanized equipment is markedly reduced in this type of terrain. Although in 1944 the Japanese vastly increased his artillery strength in Burma, this strength was still considerably less than that of the Allied forces. It was evident that the enemy's artillery tactics in this theater were controlled by considerations that (1) the artillery was subordinate to the infantry, (2) the artillery strength was vastly inferior to that of the Allies, and (3) ammunition supply, through lack of roads and mechanized equipment, was very difficult in Burma. The special considerations involved in (2) and (3) called for special tactics.

Guns were accordingly normally employed in single-gun positions, sometimes in sections (two guns). Sniping or roving guns were extensively used, though even in this role they were generally dug in and effectively camouflaged. They were, also, generally sited for special tasks, and their role was believed to be that of artillery directly attached to forward infantry. Battery positions seldom existed, but when used were sited with one gun behind the other (100 to 200 yards apart) down the line of fire. They were rarely at right angles to the line of fire.

It was evident that the Japanese conceived of artillery as primarily a weapon for direct support of the infantry. Their fires were usually confined to prearranged infantry-support tasks. This was shown by the fact that many tempting targets were ignored. When opportunities were not used to inflict ca-

ualties and cause disorganization, it was naturally presumed that this was due to the fact that the target had no direct bearing on the immediate operation.

The Japanese did not use concentrations of fire as contemplated in our Service. The most he was known to fire at one time was six medium guns. In large-scale attacks he used a steady, slow rate of fire lasting for long periods in shelling the area to be attacked, as well as any locations from which covering fire might be expected.

Japanese defensive fires were only occasionally encountered by our troops. Such fire was usually aimed at the defender's own bunkers and was brought down when attacking infantry reached the objective. It was usually registered by only a small proportion of the artillery employed.

The Japanese in this theater had no counterbattery organization, and rarely employed such fires. Apparently, they had to concede the superiority of Allied artillery, and so they took many passive measures to protect their own. They seldom fired at night, except to support infantry attacks, in which case their artillery rarely fired for more than one hour. Such measures were natural under the circumstances. The presence of aircraft of any sort caused them to cease firing. Air patrols over the enemy were therefore a useful counterbattery measure for the Allies, much as aircraft had been used to keep submarines down at sea.

There was no evidence of employment of smoke.

Accuracy and effect of fires were generally good. Concentration was accurate over a period of time, though not in a short period. There was seldom waste of ammunition. The zone of dispersion of medium weapons was small in all cases. The effect of individual rounds was comparable to that of Allied artillery. Fragmentation was good, and the speed of the impact fuze was approximately the same as that of the Allies.

In the forward areas where ground troops were active, there was only one report of antiaircraft fire by anything larger than 20-mm. On the Imphal front, some twelve to eighteen 75-mm guns of a single antiaircraft battalion were scattered throughout the area, protecting important supply installations well to the rear of the forward units. Other units were centered in the more important towns. In general, their fire was not accurate. Most pilots reported that it was quite wild. However, the special conditions as to relative air support have to be considered in this connection.

* * *

All in all, it may be seen that the nature of the theater influenced the Japanese to employ relatively little artillery there, and such as was so employed was largely transported by local means. Relative weakness led to special measures as to fires and dispositions which would not be applicable under more favorable conditions. In particular, the Allied air strength was a factor in this respect. Weak antiaircraft support in this theater cannot be taken to mean that it would have been weak or ineffective everywhere. The same conclusion is pertinent as to the counterbattery service. The concentration of fires on forward areas was a material result of relative weakness in gun strength and of difficulties of supply inherent in operations in Burma without strong air support.

The chief difference between a good and bad commander is an accurate imagination.

—Major General Charles Orde Wingate,
Leader of Chindit Forces in Burma

Motor Movement

LIEUTENANT COLONEL P. E. SMITH, *Infantry*
From *Marine Corps Gazette*

"RAPIDITY is the essence of war," wrote Sun Tzu in his *Art of War* in 500 BC. While our conception of rapidity in 1946 is markedly different from that which the Chinese general had in mind in 500 BC, his statement is as valid today as it was over 2,000 years ago. Rapidity on the battlefield is achieved by prompt issuance of orders by commanders and swift execution of those orders by troops. An important means for accomplishing mobility in the combat zone is the motor vehicle. Therefore the ability of units to move promptly and efficiently by motor may well prove decisive.

It did prove decisive in the past war. During the Battle of the Bulge, swift and smooth motor movements enabled us to shift forces comparatively long distances overnight lending our defense the mobility requisite for success. For example, the 87th Infantry Division moved 125 miles by motor overnight and straight into action. It was at just about this period that an army commander is reported to have intimated to a War Department observer that all he wanted to win the battles was men, ammunition, and gasoline. Again, in the exploitation of our breakthrough over the Rhine, motors enabled us to take full advantage of the disorganization of the enemy. An official report at that time commented, "Our Army certainly can move rapidly and smoothly."

In the Pacific theater the situation was somewhat different. Initially, in the campaigns on the atolls and small islands such as the Gilberts and Marshalls, distances to move were generally so short as to make the use of vehicles for troop transport unwarranted. Subsequently, as the attack encountered larger islands, as in the Marianas, extensive use of trucks for moving troops was impossible because of the paucity of large-capacity vehicles inherent in the early stages of amphibious operations. However, on Saipan the 27th Infantry Division supplemented their organic vehicles with captured Japanese trucks and in the final stages of the campaign used them to help move troops as required by the situation. As the war with Japan moved on to bigger land masses, more prolonged campaigns, and larger opposing forces, the use of motor vehicles as troop transport became of increasing importance. A typical example of tactical employment is reported from Luzon, where the 33d Infantry Division moved an infantry battalion by motor to seize an important town and bridge. In the Pacific area, however, there was this difference from that experienced in Europe: road nets were considerably restricted and the roads themselves much less developed. These features all the more emphasized the necessity for good planning.

One of G-3's important duties is to be able to plan soundly for motor marches. Furthermore, he must be able to do this in minimum time and with maximum efficiency. To the end, then, G-3 must be completely familiar with all the problems involved. He must have an intimate knowledge not only of the tactical considerations and coordination required but also of the technique of motor marching; and in addition he must know the capabilities of his units to execute his plan. It is only when G-3 does have a good, solid background of knowledge and information that he can produce an efficient, workable plan as a basis for efficient execution by the troops.

Coordination Required

Close coordination is of the utmost importance in planning motor marches. By coordination is meant working in harmony and with complete understanding with higher, lower, and adjacent unit staffs. Close coordination insures that the selected routes will be available and that necessary priorities are obtained at critical points. Close coordination will prevent delays and congestion with resulting exposure of columns to enemy observation or enemy attack. It will minimize that bugaboo of the troops—last-minute changes in orders.

Within the unit staff itself, close coordination and cooperation must be effected. G-3 must insure that as information becomes available or decisions are reached, they are communicated to his brother staff officers promptly. All general and special staff sections must start planning and make arrangements for facilities and services in accordance with the new situation. G-1 will want to look over the new bivouac area to assign locations. The Surgeon, Engineer, and Signal Officer must make early reconnaissance as a basis of their estimates and recommendations. G-4 is vitally interested. He must plan for supply and resupply before, during, and after the movement. Trucks must be gassed, troops fed, and new supply points arranged. All these arrangements cannot be effected overnight. Therefore, G-3 must not wait until his plan is complete before communicating it to the other staff sections. Failure to keep all staff sections completely informed as to the status of the planning phase will handicap them to such a degree they may not be able to complete their planning in time to support the proposed movement.

Tactical Considerations

With the importance of this coordination in mind, G-3 must also consider the tactical demands of the situation. The composition and proximity of hostile ground forces must be taken into account, because these will affect the organization of the columns, choice of routes, and security measures necessary. When contact is remote, administrative convenience will prevail. On the other hand, when contact is more likely, tactical considerations must be given priority. The activity of hostile aviation will be a decisive factor. When enemy air activity is negligible, full utilization may be made of road capacities. On the other hand, when the enemy has air superiority, movements may be restricted to the hours of darkness. Or we may find that neither side has complete dominance of the air. Under such conditions the use of close formations during daylight hours may be undesirable.

Security from air attack consists of both passive and active defense measures. Passive defense includes the use of extended columns; camouflage; screened entrucking, detrucking, and assembly or bivouac areas; and movement under cover of darkness. Active measures by the column consist in antiaircraft fires. The caliber-50 machine guns mounted on vehicles are manned. Heavy caliber-30 machine-gun units are dispersed throughout the column. Browning automatic riflemen on personnel carriers are detailed as air guards and instructed to fire upon low-flying attack aircraft. Motor vehicles attacked while on the road do not halt, but continue to march in order to offer a less remunerative target to the attacking aircraft. Antiaircraft artillery, when available, is emplaced at critical points along the route of march to offer area protection to the columns. Such critical points consist of defiles, bridges, fords, cities and villages, entrucking, detrucking, or assembly areas, etc.

Motor columns secure themselves from surprise ground attack by the use of advance, flank, and rear guards. Friendly air, if available, is employed. When hostile armor is a threat, antitank units are emplaced at vulnerable points along the route to give protection to the column. Proximity of enemy ground forces requires that combat reconnaissance be pushed well forward. Protection for forward detrucking areas must be furnished. The cavalry reconnaissance troop habitually screens the movement of the infantry division. Under some circumstances this unit may be inadequate for the task. In such cases, one or more infantry battalions may be assigned this mission.

Communication must be maintained during the motor march, not only within the columns but also between columns and with superior headquarters. Vehicular radio is the principal means of communication during such marches, but full advantage must be taken of any commercial signal installations available. Messenger vehicles may be used, both quarter-ton trucks and motorcycles. Liaison airplanes may be found useful under some circumstances.

Reconnaissance

One of the first things G-3 must do as he starts planning his motor march is to

send out a route reconnaissance party. The initial step of this route reconnaissance is a map study or map reconnaissance wherein G-3 tentatively selects routes, traffic control points, and other details of the march. The reconnaissance party moves over the selected routes, examines bridges, fords, and highway conditions, and notes obstacles or other details that might interfere with the movement of the motor column. In so far as G-3 has the means available, he institutes timely measures to strengthen bridges, remove obstacles, or do such other work on the roads as will facilitate the movement.

THESE SPACES FOR MESSAGE CENTER ONLY

TIME FILED | MSG CEN No. | HOW SENT

MESSAGE (SUBMIT TO MESSAGE CENTER IN DUPLICATE) (CLASSIFICATION)

NO. 1 DATE 19 June 45

TO CO 23d Inf

23d Inf will move by motor about 0800 21 June to vicinity of KAGOSHIMA to prepare for embarkation

CG 8th Inf Div (OFFICIAL DESIGNATION OF SENDER) | 0800 (TIME SIGNED)

AUTHORIZED TO BE SENT IN CLEAR | SIGNATURE OF OFFICER | Jones Col G-3 (SIGNATURE AND GRADE OF WRITER)

Figure 1.—Typical Warning Order

Orders

Very early in the planning stage, G-3 issues a warning order to subordinate units (see Figure 1). In so far as possible, the warning order should contain the elements of who, what, where, when, and why, but the absence of information on any one of these points will never be used by G-3 as an excuse for not issuing an order. The mere information that a movement is being planned is sufficient for some planning and preparation on the part of subordinate commanders. The march order itself is issued later when the planning is complete. March orders should contain all necessary details, including route, destination, schedule, rate, formation, organization, and security measures. March orders are simplified by the use of maps, overlays, march tables, and entrucking and detrucking tables. One of the principal methods of reducing detail in march orders is by the use of Standing Operating Procedure. Inclusion in unit SOP's of those details common to all motor movements not only simplifies issuance of orders but insures the prompt and efficient execution of those details. Repeated performance of duties by personnel assigned to reconnaissance parties, quartering parties and traffic control sections gives the individuals a skill in execution of their particular functions that cannot be approached by one-time performance. Other items such as organization of columns, reports en route, procedure at halts, etc., may be included in SOP's. When the situation requires departure from SOP, then such changes are included in the march order.

Technique

In order to plan his motor movement intelligently, G-3 must also be thoroughly familiar with the technique of motor marching. Such knowledge enables him to visualize, foresee, and plan for all the details incident to such movement. Actual experience in making motor marches is the best foundation for such familiarity, and any officer who finds himself required to plan motor marches and who has not had such experience should take steps to accompany his units on a march at the earliest possible opportunity in order to acquire that experience.

Under "technique" we may include:

1. Organization for motor marches.
2. Control of the column.
3. Formations.

Organization for Motor Marches.—When we refer to a *column* in motor marches we mean all the elements of an organization using the same road for a single movement under one commander. A column commander is generally designated, and it is he who issues orders to the various units comprising the column. These orders, of course, are based on those he has himself received from higher headquarters. An infantry division may march

in one or several columns. The basic subdivision of a motor column is the *march unit.* A march unit is an element which halts or moves on order or signal of its commander. It may be a definite number of vehicles, but preferably should be a tactical subdivision such as a company, or more rarely, a battalion. March units are designated primarily for control purposes. Two or more march units may be organized into a *serial.* A serial is usually composed of those march units to which a single set of orders will apply and is organized primarily for simplification in the issuance of orders. Column, serial, and march unit commanders act as the principal control agencies within the column. Serials and march units generally move with a prescribed time interval or gap between them. This gap serves to reduce traffic to an amount that can flow past the most difficult part of the terrain en route.

Control of the Column.—Now how are these various subdivisions of a column put on the road in the order planned, and at the proper time and distance? This detail is controlled through the designation of an Initial Point (IP) at which a control officer is stationed (see Figure 2). Each march unit has its IP and the hour at which it is to pass that point designated in orders. March units leave their entrucking areas at such time as to arrive at the IP exactly at the hour designated.

En route to the new area there may be one or more critical points. By critical points is meant those places where scheduled or unscheduled cross-traffic is encountered, or where restrictions have been imposed or priorities obtained. It may also include one-way stretches of road, narrow bridges, fords, or any other point at which the column may be delayed or where interference may be expected. At such points, control posts are placed by the column or division commander, or by superior headquarters. These control posts enforce march orders and insure that the units conform to the schedules prescribed. Guards are placed at those points where the safety of the column may be endangered by adverse road conditions. Guides or route markers are installed as necessary to insure that the march units do not deviate from the assigned route. At the entrance to the new area or destination, a Regulating Point (RP) hould be installed. The purpose of the Regulating Point is to direct the various subunits to their proper places within the new area.

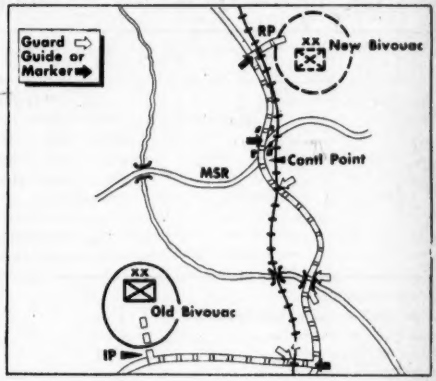


Figure 2.—Control of Motor Columns

It is at this point that unit guides meet their units and guide them in.

Formations.—In what formation are these trucks within the march units? How far are they apart? At what rate do they move? These details, of course, will be included in orders, but must be based on the capacity of the road, the enemy situation, capabilities of the vehicles, restrictions of higher headquarters, and sometimes on operating personnel. Close formations in which the trucks move only at safe driving distance utilize fully the road capacity, but are very vulnerable to hostile air attack and observation. On the other hand, extended formations waste road capacity but are comparatively secure from such enemy activity. We define three types of common road formations, namely close column, open column, and infiltration. Close column is that formation in which vehicles are separated only by safe driving distance. Note that the

density varies inversely with the speed in this formation. Open column is a formation in which the vehicles move at a prescribed density within the limits of ten to twenty-four trucks per mile of road space, or to put it in another way, in which a definite distance between trucks is prescribed. The density in this formation does not vary with the speed. Open column is a compromise formation between the conflicting requirements of large traffic flow and wide dispersion. Infiltration is a formation in which the vehicles are irregularly dispatched at a prescribed low density. This density may range from one to nine trucks per mile of road space.

Work Sheet—Availability of Motor Transport for Troop Movement[1 2 3]

Priority	1 Normal Use	2 3 Inf Regts (each)	3 3 Inf Regts (each)	4 3 FA Bns 105-mm How (each)	5 FA Bn 155-mm How	6 Engr Bn	7 Engr Bn	8 Med Bn	9 Med Bn	10 QM Co	11 Sig Co	12 Sig Co	13 Total	14 Total	15 Aggregate
		1½-ton	2½-ton	2½-ton	2½-ton	1½-ton	2½-ton	1½-ton	2½-ton	2½-ton	1½-ton	2½-ton	1½-ton	2½-ton	
1	Cargo Trks									48				48	48
2	Pers & Orgn equipment	1	2	1	1		1		6			2	3	19	22
3	Am & Pion tools	3											9		9
4	Kl Trks		19	5	5		4	2	3	1		1	2	86	88
5	Engr tools						36							36	36
6	Assault boats						1							1	1
7	W Sup						3							3	3
8	Am & AT mines	2	9	15	9		3						6	84	90
9	Comd & Opns	1		1	1					1	1	1	4	6	10
10	Med Sup								3					3	3
11	Sig Com		1	1	1						3	10	3	17	20
12	Atchd Med		1			1							1	3	4
	TOTAL	7	32	23	17	1	48	2	12	50	4	14	28	306	334

[1] The availability of cargo trucks and priority of such availability are command decisions.
[2] Prime movers omitted.
[3] Maintenance vehicles omitted as they usually accompany motor vehicles of the unit.

Figure 3.

Halts

During long motor marches, it is customary, when the situation permits, to have the march units halt periodically for the purpose of maintenance and resting personnel. In such cases, vehicles are moved off the highway as far as possible. When vehicles cannot be gotten off the highway, guards must be placed at head and tail for safety purposes. Troops dismount and stay clear of the highway. When long halts are prescribed by orders, the area in which the vehicles are to halt is selected with reference to their being able to clear the road. Commanders may take advantage of these halts to send motor messengers along the route of march with orders for subordinate commanders.

Movement by Echelon

When no additional transportation is available, G-3 of an infantry division has additional problems facing him, because then

must plan his movements using only organic vehicles. The infantry division has over 5,000 men on foot for whom no transportation is organically provided. These foot soldiers are located entirely within the infantry regiments, the balance of the division being completely motorized. While the infantry division has over 1,400 vehicles assigned organically, all these vehicles should be maintained by G-3. An example of such a work sheet as contained in FM 101-10 is shown in Figure 3. In compiling such a table for the use of a unit in the field, the local situation and commander's desires will govern. Tables must be periodically revised. How, then, does G-3 use these vehicles to transport his foot troops? Ob-

Assignment of Motor Transport for Movement of Foot Troops (MM1)

	1	2	3	4	5
1	*Unit from which transport is furnished*	*Number of 2½-ton trucks provided and unit to which furnished*			
		1st Echelon		*2d Echelon*	*Alternate 2d Echelon*
		1st Infantry	*2d Infantry*	*3d Infantry*	*3d Infantry*
2	1st QM Co	48			31
3	1st Engr Bn		26		
4	1st Med Bn	8			
5	1st Sig Co	3			
6	1st FA Bn			11	
7	2d FA Bn			11	
8	3d FA Bn		21		
9	4th FA Bn	16			
10	1st Inf			26	22
11	2d Inf			27	22
12	3d Inf		28		
13	TOTAL [1]	75	75	75	75

[1] Total number of trucks required is based on:
Total foot troops in each infantry regiment—1,818 (an arbitrary figure not to be applied to any specific unit).
Passenger capacity of trucks: 2½-ton—25; 1½-ton—15.

Figure 4.

have basic loads which must first be dumped if they are to be used as personnel carriers. This is true save for thirty-two out of the forty-eight 2½-ton LWB cargo trucks assigned the Quartermaster Company. With the exception of prime movers and weapons carriers, all of the large-capacity trucks of the division may be considered a pool of transportation to be used as required. A work sheet showing availability and priority of viously, organic loads and personnel cannot be transported at the same time. Under such circumstances, G-3 resorts to movement by echelon. He causes the organic loads of some trucks to be dumped in the old area and employs these vehicles to move troops to the new area, after which they return to pick up their basic loads. In doing this, G-3 has constantly in mind the necessity for keeping his fighting units intact; that is, maintaining

tactical integrity. Furthermore, he must insure that troops are never separated from their weapons, and that ammunition and other supplies accompany each unit in sufficient quantity to enable them to engage in combat for the period of time until resupply can be established. Therefore G-3 cannot plan to dump all basic loads in the old area and move all the troops in the first echelon and then return the trucks to pick up their basic loads for the second echelon. On the other hand, he must plan to send on each trip balanced amounts of men, weapons, ammunition, and other supplies. There are innumerable way in which this can be accomplished. One such plan, taken from FM 101-10, is shown in Figure 4 as an example and guide for the preparation of SOP's on this type movement.

Use of Additional Transportation

Because of the additional problems posed by movement by echelon, the most efficient method of moving an infantry division by motor is to furnish additional transportation from outside sources. The Quartermaster Troop Transport Battalion is specially equipped for this mission. This battalion has available 288 2½-ton LWB cargo truck which are entirely adequate under most cir cumstances to motorize an infantry divisi completely.

It can be appreciated now that the creati of a sound, workable plan by G-3 for a mot movement must be based on his intima knowledge and familiarity with all phas of such movements. In developing his plan close cooperation and coordination, both with in the unit staff itself and with the staffs o higher, lower, and adjacent units, must be maintained. G-3 must consider the tactica demands of the situation in planning the movement. He must choose the formation in dicated by the situation and provide for the necessary control. When additional non-or ganic vehicles are not available, G-3 plans his echelon movement so as to transport men, weapons, ammunition, and other supplies in carefully balanced quantities in order to maintain fighting efficiency.

The pay-off of a good planning job is smooth execution by the units concerned. On the other hand, poor, inadequate, or unwork able plans result in confusion and delay, and in some cases may be the cause of disaster.

Japanese Casualties

From *Marine Corps Gazette*

JAP army and navy casualties numbered about 5,085,000, according to a Japanese spokesman, but at the end of the war the nation's military strength was nearly three times that of 7 December 1941. Japan ended the war with an army of 5,500,000 as contrasted with the 1,900,000 at the time of Pearl Harbor. Army casualties included 310,000 killed; 146,000 wounded; and 4,470,000 sick, of whom 40,000 died. Navy casualties were 157,365 killed; 1,430 dead from sickness and 1,483 missing. The navy dead included 2,065 suicide pilots. Approximately 200,000 of the army dead committed suicide in the face of capture of similar Nipponese "dishonor."

MILITARY NOTES AROUND THE WORLD

GREAT BRITAIN

Royal Naval Air Arm:

The original Royal Naval Air Arm was formed just before the last war and was known as the Royal Naval Air Service. It fought throughout World War I, and by 1918 had 3,000 aircraft, 5,000 officers, and 50,000 enlisted men. In that year, however, the RAF was formed and the Admiralty gave up control of naval air matters. In 1924 a compromise was arrived at by which roughly half the pilots flying for the Navy were RAF officers and the other half naval officers. The Admiralty took over control of all aircraft actually embarked in carriers. This arrangement remained in force until a few months before the outbreak of World War II when the Admiralty assumed complete control of the Naval Air Arm and also of all Naval Air Stations ashore. Last year the old title "Fleet Air Arm" lapsed, and the title "Naval Air Arm" took its place. At the outbreak of World War II the British Navy possessed a small but efficient air arm and had seven operational aircraft carriers. Throughout the war years it had steadily increased in strength and numbers, largely with the assistance of American-built aircraft and escort carriers (CVE's), until now it is stronger and more powerful than it has ever been before.

(*Britain*, British Information Services)

Swimming Tanks:

The Duplex-Drive tank was officially born in 1941. The principle of flotation employed was remarkably simple. It consisted of a collapsible canvas screen fitted to the hull of a tank and raised or lowered at will. When erected, the screen completely surrounded that part of the tank above the tracks and, based on the principle of displacement, enabled the tank to float. At the touch of a lever, the screen collapsed, to lie like a skirt

about the hull. Power came from propellers at the rear turned by the main driving shaft. It was easy to operate and could go into action within a few seconds of its tracks touching dry ground and the driver lowering his canvas screen. It was extraordinarily seaworthy and quite capable of surviving all but the highest seas.

The greatest secrecy had been maintained throughout as to the very existence of these tanks. Production had been behind locked doors. When D-day came, one regiment, the 13/18th Hussars, launching their tanks some 5,000 yards from the shore, brought in thirty-three out of their total of forty.

It had always been hoped that the Duplex-

Drive device had been kept secret and that the Germans would take the tanks for nothing more than a fleet of small boats, probably containing infantry. Everything points to this having happened. On one beach, where the infantry were meeting stiff opposition, the German defenders held up their hands the moment a number of these "monsters" emerged from the sea, shook off their skirts, and opened fire.

The picture on the preceding page shows one of the swimming tanks gliding into the Rhine during the assault across the river. At the back are seen the propellers which enable the tank to sail at four or five knots.

The picture above shows Sherman swimming tanks at Launberg with their canvas screens lowered. The twin propellers are still in place at the rear, but have been raised to avoid the ground.

The Duplex-Drive tank is, of course, very vulnerable to fire, which, if accurate, will sink it.

(*The Sphere*, Great Britain)

INDIA

Indian Army's Part in the War:

Of just over one million troops, representing nine countries, under ALFSEA Command on 1 June 1945, well over 700,000 were provided by the Indian Army. British numbered more than 183,000 (including officers and other ranks serving with the Indian Army and other forces), and there were 77,000 West Africans, 49,000 East Africans, 18,000 Americans, and 10,000 troops of the Burma Army.

The United States made a substantial contribution to the air war in Burma, providing at least half of the troops and supply transport at one time. On 1 June 1945, there were 23,000 American Air Force personnel, approximately 50,000 Royal Air Force and 9,500 Royal Indian Air Force under Southeast Asia Command.

(Government of India Information Services)

Indian Army Commissions:

The Government of India has had under consideration for some time a policy to be followed in the future officering of the Royal Indian Navy, the Indian Army, and the Royal Indian Air Force and has made the following decisions:

The grant of permanent commissions in the Royal Indian Navy and the Indian Army will in future be restricted to Indians and to other persons domiciled in India who are subjects of His Majesty or of a Prince or Chief in India.

It will be generally recognized that the three Indian services will still require a quota of British officers until such time as there is an adequate supply of qualified Indian officers to fill completely all grades in the officer cadre. It has been decided, therefore, that British officers for service in the three Indian services shall hereafter be obtained by secondment or attachment from the Royal Navy, the British Army, and the Royal Air Force respectively for so long as may be found necessary.

The quota of seconded or attached British officers of the three Indian services will be systematically and progressively reduced as Indian officers become available.

These decisions do not affect the position of the regular British officers already holding permanent commissions in the Royal Indian Navy and the Indian Army.

(Government of India Information Services)

GERMANY

The Me 163 "Komet":

German experiments in jet propulsion and rocket-assisted take-off produced much that was revolutionary in aircraft performance and design. It appears, however, that one of the main difficulties confronting the Germans was a lack of endurance, and although some of the performance figures appear to be staggering, in actual fact they could be maintained for such a small space of time as to make them doubtful quantities in operation. One type of rocket-propelled interceptor which actually went into service several months before the collapse was the amazing little Me 163 "Komet," a semi-tailless design capable of a level speed of about 550 miles per hour and able to climb to 30,000 feet in just over two and a half minutes. The Me 163 normally took off under its own power, jettisoned its wheels, and landed on a skid. It was armed with two 30-mm guns, and was built partly of wood. In order to increase the endurance, a later model, the 163C, had a special rocket unit incorporating a second jet to give cruising economy. The endurance under power was about twelve minutes, and the maximum speed 590 miles per hour. Rocket-propelled interceptors of this sort were comparatively quick and cheap to build.

(*The Sphere*, Great Britain)

German Development of Radar:

In 1935 the Telefunken Company in Berlin revealed details of a 10-centimeter "mystery ray" system said to be capable of locating the position of aircraft through fog, smoke, darkness, or clouds.

Radio beams could be sent upward at a fixed angle from a large group of microwave transmitters. After reflection from the airplane, the "echoes" were picked up by a group of receivers built in small weatherproof boxes which could be mounted on top of church steeples and tall buildings.

The basic early warning set used by the Germans was known as *Freya* and dates back to 1939. This set and its several variants is comparable to the U.S. Army Signal Corps original ground radar and to similar equipment used by the British.

An extensive chain of such radar sets in France and the Low Countries provided the Luftwaffe with sufficient warning to meet the bulk of the RAF and AAF heavy bomber missions until early 1944.

The year 1940 saw a very useful set put into operation by the Germans. Known as the *Wurzburg*, it was used for searchlight control to spot night bombers, antiaircraft fire control, height finding, and GCI (ground-controlled interception).

By late 1941 a 12-ton giant *Wurzburg* came out, with double the range of the small set and a narrower beam, which made it suitable for GCI operations. Both sets were provided with IFF (identification, friend or foe) which operated with a small transponder carried on all German aircraft.

For the ASV function (air to surface vessel) the basic German set was known as *Hohentwiel*, with antenna carried ahead of the nose. This set was used in practically all of the types of planes used against shipping.

German airborne interception equipment was not developed until 1941. At the start of the war they depended on an infra-red device which proved entirely inadequate.

The first AI set was called *Lichtenstein*, and was very similar to the early British AI equipment, which came out sooner. The latest night fighters (Ju 288, Me 410, etc.) had greatly improved AI equipment, with greater range, wider sweep, more discrimination, and an airborne IFF set.

Consensus indicates that the Germans slipped a cog very badly in their failure to keep up their developments of radar in 1940-42, especially in the mirco-wave field, blind bombing devices, and more effective sea-search equipment.

(*Aviation News*)

NETHERLANDS

Commandos in the Indies:

One of the toughest commando battles of the Pacific War occurred on Java. It was revealed with the release of the first report on secret intelligence activities in the Netherlands East Indies. The battle was won by the commandos of the Netherlands Indies Army, who had been landed previously by Netherlands submarines cooperating in the intelligence operations.

The report told how hundreds of picked officers and men were landed on and brought back from various occupied Indies islands in daring operations which made it possible to maintain a constant stream of intelligence reports on enemy activity in the conquered territory.

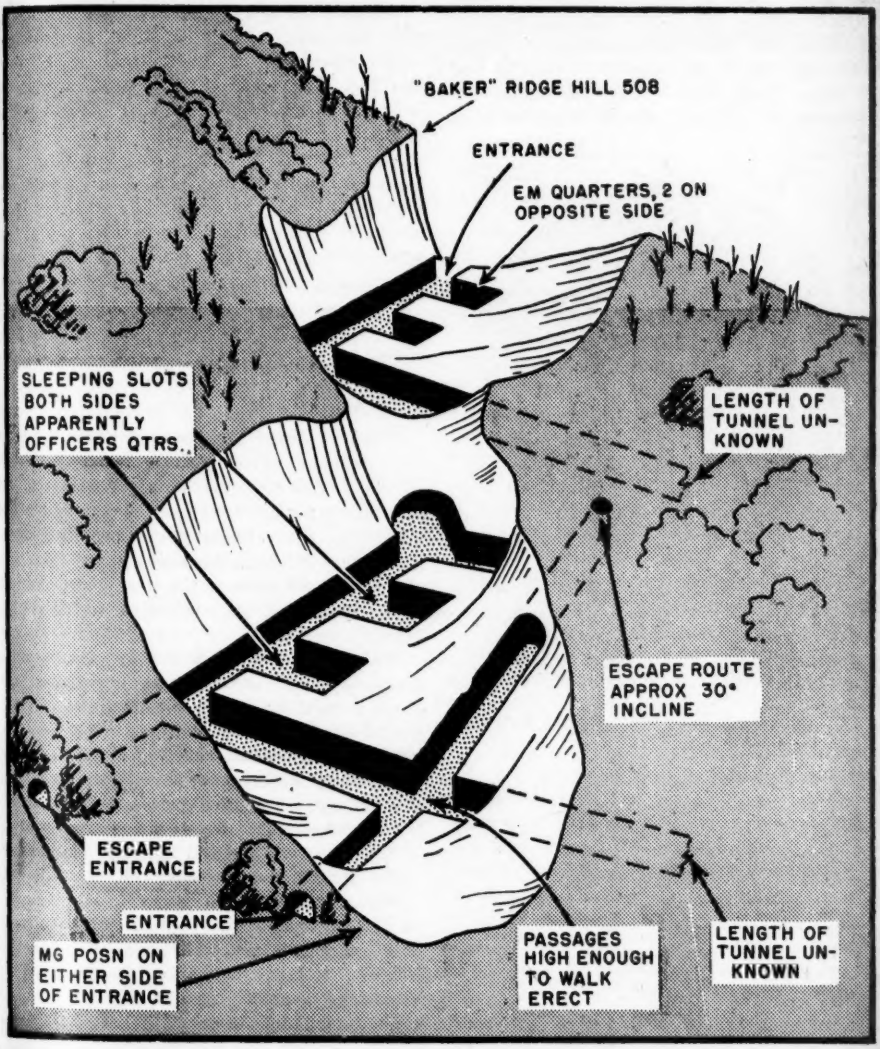
Many of the men who participated in the operations, of course, died. There often was severe fighting and on one or two occasions a submarine was discovered by Japanese planes or coastal boats and had to make its escape, leaving its passengers behind.

The Netherlands submarines began their intelligence operations with the arrival in western Australia in the middle of last year of the British ship *Maidstone* with Lieutenant Commander H. F. Bach Kolling, who was to command the submarines engaged in the work, aboard.

He never had more than six submarines under his command at any time, and some of these were frequently under operational orders from the Royal Navy and others under orders from the United States Navy. His undersea craft would set out from Fremantle with ten to fifteen picked intelligence officers or commandos of the Netherlands Indies Army and make for selected points on the Indies coastline. There they would land their passengers and provide protective marine guard from the submarine crew. The submarines were always in danger of air and sea attack, yet each had to keep its rendezvous and take off any landing party under the very noses of the Japanese.

(*Netherlands News*)

Typical Jap Command Post Cave:



This cave was located on the southeastern slope of Kongo Fortress (Hill 508), Luzon, Philippine Islands, south of the Villa Verde Trail. It was the command post of the Japanese Major Sampei of the Central District Unit. The total length of the cave was 150 feet.

Crash Helmet:

The picture below shows an improved helmet liner that is more comfortable than former models, while providing better head protection for tank crews and others whose heads are apt to be roughly treated in line of duty. The outer shell resembles the standard helmet liner, except that the brim

is trimmed away for better access to sighting instruments and the like.

Inside the liner are suspension pads at the dome, back of the neck, and forehead, made of molded sponge rubber, covered with leather. Cradle straps, sweat band, and the band at the back of the neck are adjustable.

(*Quartermaster Training Service Journal*)

Servicing Army Vehicles:

A completely new technique of servicing Army vehicles has proved so successful at Fort Belvoir that recommendation will be made to adopt the system in the Army Service Forces installations throughout the United States. Acting as experimental station for ASF, the main motor pool recently remodeled its large shop building to establish two long production lines to conduct "preventive line maintenance." Each line has been departmentalized so that mechanics perform specialized operations instead of a multitude of tasks required under the old system. Each vehicle, upon entering the building, visits each station in succession and comes out the opposite end ready for the road. The system includes both the 1,000 and 6,000-mile inspections. This has resulted in speeding up the servicing and reducing the number of repair orders.

(*The Military Engineer*)

Tank Telephone:

The U.S. Army Signal Corps has developed an interphone extension kit which, in conjunction with the normal interphone system of various tasks, enables troops inside and outside of the vehicles to communicate with each other without the necessity of opening the tanks and without the use of any equipment other than that installed in the tanks themselves.

When the noise of the moving tanks makes shouting futile, the external interphone box enables men outside to report dangers, opportunities, special conditions of all kinds, giving information that sometimes spells the difference between successful operations and failures. The tank crew also can secure better and quicker cooperation from the men of the unit working and fighting outside.

The interphone extension kit is made up of an external interphone box to be mounted on the outside of the vehicle, a switchbox to be mounted near the tank commander's position, and the necessary hardware and cordage to complete the installation.

The interphone extension kit was developed for use during the last months of the European war.

(*Army and Navy Register*)

FOREIGN MILITARY DIGESTS

Notes on the Burma Campaign

Digested at the Command and General Staff School from an article in "Indian Army Review" October 1945.

HERE in cold logistics is the operational story of how troops of Admiral Mountbatten's Southeast Asia Command overran Burma by land and won Rangoon.

The Battle for Burma, which is as big as France with almost none of that country's lines of communication, lasted just over a year. It began in June 1944 at the time of D-day in western Europe, when the tide turned in favor of General Slim's Fourteenth Army. The Japanese attempt to invade India across the Chindwin was broken. The Imperial Army was in retreat, and from that time onward neither geography nor the monsoon season was allowed to halt an advance which ended with the last brilliant dash into Burma's capital.

From 8 June 1944 to 1 May 1945, the Fourteenth Army swept 900 miles from Kohima to Rangoon at an average advance rate of 2.8 miles per day over a period of 326 days. The fastest advance by any infantry, which in this instance was trained and equipped on the lines of Wingate jungle troops, was in November. Then General Rees's 19th Indian Division crossed the Chindwin River and struck out east. In twenty-eight days British Indian troops slogged their way over 140 miles through appalling hill-country. Later the mechanized Fourth Corps went one better.

In the final stages of the dash by land forces towards Rangoon an armored brigade with motorized infantry brigades covered 299 miles between Yemethin (thirty-nine miles south of Meiktila, starting point for the final thrust) and Pegu in sixteen days—a rate of advance of fifteen and a half miles a day with the temperature over 100 degrees in the shade. In one day alone fifty-six miles were covered.

The Japanese suffered heavily in material losses. Between 1 January and 15 May 1945 the "bill" read:

Captured or destroyed by our ground forces:

Guns	450
Vehicles	1,250
Locomotives	20
Railway rolling stock	1,000

Our armor with Shermans, Lee-Grants, and Stuarts claimed a large proportion of booty. Two armored brigades, the 254th Indian Tank Brigade operating on the Irrawaddy axis with the 33d Corps, and 255th Indian Tank Brigade moving down the railway axis under Fourth Corps, were used. The 254th Brigade covered approximately 950 miles. The 255th topped 1,000 miles. Percentage of tanks kept in action was remarkably high, varying between eighty and ninety percent. The casualty figures of enemy killed by tanks was 7,000. Two ammunition trains complete with locomotives were captured intact.

The world knows the story of the secret concentration of tanks which went through the jungle approaches of Assam and down on to the Shwebo plains in Burma. This is what it meant in effort: for the 254th Brigade,

469 transporter lifts involving a total lift of 9,203 tons and at total distance of 102,966 miles. The 255th took part in the Fourth Corps assault at the crossing of the Irrawaddy at Pakokku in February. Special rafts capable of carrying forty-five tons each were used, and 232 raft sorties carrying 9,328 tons in six days was the result.

In one month—March—one brigade alone consumed 93,160 gallons of petrol. Every drop of this petrol was suppled by air.

Three armored car regiments also operated. Two of the regiments covered over 1,500 miles each; the third completed just over 1,000 miles. The percentage of armored cars kept in action in three regiments was slightly higher than the tank record, varying between eighty-three and ninety percent—a proof of the higher standard of maintenance. In an approach march, one regiment covered 850 miles in twenty days over extremely bad road. Three regiments killed 2,500 Japanese between them.

Artillery figures are equally impressive. Between January and April 1945, over half a million shells of twenty-five pound caliber were fixed. More than 70,000 medium shells were also used. The great majority of shells —to the tune of some 12,000 tons in all— were flown in by air.

Some forty British, twenty Indian, and ten African artillery regiments were employed in operations. Men manned guns ranging from pack artillery on mules to big tractor-drawn mediums, and on one occasion 25-pounders were mounted on barges. An air observation post squadron with aircraft piloted by artillery officers did particularly good work. Up to six sorties a day were flown under all conditions.

Admiral Mountbatten has since stated that on the air supply side of the Burma campaign prodigious results were achieved: "In March alone we lifted 48,250 tons and 26,600 men. On our best days we lifted almost 4,000 tons, which is by far the biggest lift of the whole war and has not been touched in any other theater."

French Aviation From 1940 to 1945

Translated and digested at the Command and General Staff School from a French article by Colonel L. M. Chassin in Revue des Questions de Défense Nationale July 1945.

IN 1940, French aviation had been crushed by the weight of numbers. With 600 fighter planes and 100 bombers, it had fought against an enemy with 5,000 planes. In spite of its inferiority, it had caused the enemy serious losses, bringing down 919 Nazi planes, while losing 306 planes of its own.

When hostilities ended in France, General Vuillemin decided to send to North Africa all available war planes; and 600 of them crossed the Mediterranean from 17 to 29 June in the hope of continuing the struggle there.

The armistice seemed to put an end to French aviation. Nevertheless, after a period of difficult negotiations, we succeeded in obtaining authorization for the retention, in the armistice army, of a relatively considerable number of groups (sixteen pursuit, thirteen bomber, six reconnaissance, and three transport groups), about 600 planes, and the right to continue the training of 1,250 pilots. Three-fourths of this personnel and of these groups are stationed at present in North Africa and in the French Army of Occupation.

During the course of this dark period General de Gaulle and General Valin had created and organized in the Empire the Free French Air Forces, which at the end of 1942 were made up of three pursuit groups ("Alsace," "Ile-de-France," and "Normandy"), two bomber groups ("Lorraine" and Brittany"), and one coast patrol group ("Artois"), that is, about 120 war planes. In addition to this, many French aviators were serving in an individual capacity in the squadrons of the Royal Air Force.

Rearmament

As soon as North Africa re-entered the war in November 1942, our old Lioré-45's, Douglases, Glenns, and Bloch-174's, whose lives had been miraculously prolonged by our mechanics, immediately participated in the Tunisian campaign.

In a symbolic gesture, after December 1942, the Americans equipped the Lafayette pursuit group with modern Curtiss P-40's, and it was sent into action at Souk-el-Arba.

Immediately after the Conference of Anfa, at the end of January 1943, a plan to rearm French aviation was formulated in agreement with the Allies.

The United States took charge of the greater part of the program—two wings of medium bombers, of three groups each; nine pursuit groups; and two reconnaissance groups. England offered us two groups of heavy four-motored Halifax bombers and three new groups of Spitfires. France was charged with the task of resuming the basic training of her old pilots with the equipment she had left. These young fliers were sent to the United States or to Canada.

From then on, the situation developed rapidly. Ten fighter groups (260 planes), equipped with Airacobra P-39's, Curtiss P-40's, and later with P-47 Thunderbolts, were established in Africa in 1943. Charged at first with the task of protecting Allied convoys on the Mediterranean coast, they gradually became engaged in ground operations in the tactical support of our armies, first in Corsica and Italy, and finally in France.

The medium-bomber wings, equipped with 100 bimotor B-26 Marauders, were in their turn given a place, in 1944, in the center of activities of tactical aviation in the Mediterranean Theater. They were noted from the very outset for the accuracy of their bombing. Upon their arrival in France, they were organized as an independent brigade.

The two heavy English groups, after a long period of retraining, went into action a short time before D-day and took part in the pounding of Germany and in the support of General Eisenhower's troops in Normandy.

Equipped with Lightning P-38's, a high-altitude photographic reconnaissance squadron sailed the French skies for more than a year preparing the reconquest of our soil. It was part of Group 2/33, in which Major de Saint-Exupéry, who disappeared on 31 July 1944 during the course of a mission over Grenoble, served. In the meantime, its sister squadron, equipped with Spitfires, was engaged in missions of tactical reconnaissance over the battlefields of Italy and France. A legion of small observation planes, the Piper Cubs, also rendered the greatest of services to our artillerymen during the course of the Italian campaign.

Thus, back in France, our combat aviation consisted of fourteen fighter groups, ten bomber groups, two reconnaissance groups, and two transport groups. It also comprised six groups of antiaircraft artillery (200 guns), charged with the antiaircraft defense of our soil, and three regiments of paratroops, one of them trained in Algeria and the other two in England.

Gradually, the Air Corps had won its independence. In the beginning, our groups were employed in the Allied set-up, in wings under Anglo-Saxon command. But as soon as we were able to handle our own supply problems and form the necessary staffs, French fighter and bomber wings were included in the formations under Allied command.

After our arrival on our own soil we rose a step higher. The 1st French Air Corps, under the command of General Gerardot, absorbed the greater part of our air forces. With the XII U.S. Tactical Air Command, it formed the First Tactical Air Force, which was charged with the support of the operations of the army group (7th United States Army and 1st French Army) under General Devers.

Later, after the liberation, new groups were created in France, with salvaged German equipment or equipment furnished by the Allies. The Commander of the Air Forces of the Atlantic assembled five new fighter groups, two bomber groups, and one recon-

naissance group during the course of the Royan and Verdon operations.

From 1940 to 1945, our fighter aviation brought down 659 planes (272 accounted for by the Normandie-Niemen Regiment alone, fighting on the eastern front with Soviet planes). Our bombing planes dropped 26,000 tons of bombs. Our personnel losses were close to 600 men.

The Present Situation

Back in France, the first task has been to restore order in our devastated home, to repair what was destroyed, to re-embark on our programs of aeronautical construction, and at the same time establish a coherent program for the development of our air force. The territorial organization has been resumed. Five air districts and eleven subdivisions have again been created, as well as ten air commands in our colonies. All our demolished installations are being rapidly repaired.

Our air arm comprises at the present time, on a war footing, some 140,000 men, including 8,500 officers and 30,000 noncommissioned officers.

Our aviation industry has started production once again and at present engages more than 100,000 workmen. Since the liberation, about 800 planes, the majority outfitted as transport planes, have been built. France has learned, through a harsh lesson, the importance of the air arm. France is determined to possess an effective air force and will develop aeronautical research. The National Congress of French Aviation, which met at the Sorbonne from the 3d to the 8th of April last, was attended by no less than 6,000 members.

Air Sports and Civil Aviation

In order to develop a taste for aviation in France, the Air Minister has created a National Federation of Air Sports which includes all the regional air clubs, and in the Ministry itself he has created a Service of Aerial Sports charged with the duty of placing at the disposal of these clubs the matériel, the structure, and the required instructional personnel.

Our civil aviation which at present has very poor equipment, has already begun to improve. In spite of all the present difficulties, however, it operates a network totaling almost 90,000 kilometers—almost twice as great as in 1940.

A program of reconstruction is now under way and provisions have been made for modern radio and meteorological equipment. France needs powerful transport aviation in time of peace, as well as in time of war.

The French Army From 1940 to 1945

Translated and digested at the Command and General Staff School from a French article by Lieutenant Colonel Grévy in "Revue des Questions de Défense Nationale" July 1945.

THE history of the French Army during these five years may be divided into three periods: (1) June 1940 to November 1942, in which the Free French Forces took part in all battles, though they had no corps nor even divisions, being limited to a few small units which gave proof of their fighting ability, in spite of their inadequate means. (2) November 1942 to June 1944, in which the Army underwent a constant and considerable growth in personnel—officers, noncommissioned officers, men who had been called to the colors, and volunteers who were trying to join the Army in spite of a thousand difficulties and the most unbelievable hardships in order to find a place in the first new units, in which the combat power was increased by the constant acquisition of equipment of all sorts. During this period it succeeded in developing into a formidable instrument of war whose qualities were proven in the campaign in Italy. (3) June 1944 to May 1945, in which the reconstitution of the French forces was helped, from the point of view of numbers, by the liberation of the capital, which permitted it to take an active

and a most glorious part in the liberation of our territory and the crushing of the enemy forces on our own soil and, later, in southern Germany and Austria.

On 24 June 1940 General de Gaulle proclaimed: "There must exist an ideal. There must exist a hope. The flame of resistance must glow and burn somewhere." Later he announced from London the creation in England of the 1st Free French Brigade, which would symbolize the ideal of France, maintain the military traditions of the country, and constitute the basis upon which the new army would be built.

From France, as well as from all corners of the Empire, many hastened to rally around this nucleus. But their numbers were still small. For almost two years they made up for the inadequateness of their means with their enthusiasm and valor, so that General Koenig was able to say that "a battalion was a little formation and that three or four battalions constituted a treasure of considerable worth, not only to France but also to the Allies." It was possible, therefore, to send the French Brigade of the Orient into Eritrea where it contributed brilliantly to the conquest of Italian East Africa and, together with the English Divisions, assured, by means of its presence on the frontiers of Palestine, the conservation of our mandate in the Orient and the maintenance of our traditional influence in that part of the world.

The French units of the Orient, after they had been reorganized and their ranks replenished, were sent to Egypt and incorporated into the British 8th Army. But before considering further the history of these units, it is well to explain our situation in Rabat, Algiers, and Tunis, and the position of the French Forces in North Africa.

In September 1939, out of fifteen divisions of infantry and one division of cavalry that had been mobilized in North Africa (without counting supplementary forces) five were sent to France where they fought in May and June of 1940 and a sixth was sent to the theater of operations in the Middle East.

At the time of the armistice, ten divisions remained scattered from Morocco to Tunisia. Though none of them was motorized or had heavy weapons, they had a few old-model combat-car units, a few battalions of old light tanks, and some artillery and anti-aircraft artillery which could have provided the backbone for a new army. But the clauses of the armistice required their demobilization, and it was necessary to wait for the Allied landings in November 1942 to remobilize immediately five divisions which were later engaged in Tunisia, where they fought with their 1939 armament. After suffering serious losses in both personnel and matériel, they were obliged, at the end of the operations, to undergo a complete reorganization which included their fusion with the French units from Egypt and Lake Tchad (units of colonial infantry that since July of 1940 had represented France in the deserts of Africa and had participated heroically in the first conquest of Sidi Barani and Tobruk).

This was the situation when the general armament plan, conceived by the command and dictated by events, was to be put into effect. The problem that presented itself was, essentially: to fill vacancies in the ranks and cadres, to amalgamate the various units—whether they came from France proper or the colonies, to organize the various units in accordance with a single plan, and to provide them with the equipment and armament that is indispensable in modern warfare.

In order to bring the troops to war strength, a drastic mobilization was decreed, involving twenty classes (1924-44) in North Africa reinforced by volunteers from France proper.

For the development, intensive instruction, and training of new cadres new establishments were created, the most interesting of which was the Cherchell School, the Saint-Cyr of North Africa, which was opened in December 1942. Besides this, the Bou-Saada School in Algeria and the Dar Beïda School in Morocco were established for the training of native cadres. Artillery-observation pilots were trained at the Lourmel School and mechanics were indoctrinated at the Hussein-Dey School. The American Army was asked

for qualified instructors in the practical employment of modern equipment.

With these measures, the desired homogeneity was obtained. Up to that time, the units of the Free French Forces had been of the British type; while the native North African divisions were still of the old French type, scarcely modernized. It was, therefore, indispensable that the American type be adopted, since the equipment and armament our forces would have to use were to be furnished entirely by the United States in accordance with the stipulations of the Lend Lease Law.

At the Anfa Conference (23-25 January 1945) General Giraud obtained the armament for eight divisions. After the formation of the French Committee of National Liberation, it was agreed that five infantry divisions and three armored divisions would be organized. Two of them would come from the Free French Forces (one armored division and one colonial division), one from the French Army of Occupation, five from North Africa (two infantry divisions, two armored divisions, and one mountain division), or a total of 300,000 men including the general reserves and the services. These forces, essentially combat troops, were to be supplemented by another force of 200,000 men required for policing the territories that were to be governed, and for the maintenance of French sovereignty within the Empire. The rearmament plan was immediately put into effect, in spite of the difficulties occasioned by the technical problems of transportation, maintenance, and distribution. The required improvisations worked out successfully, and the steady efforts of the North African railways and the port establishments in Casablanca permitted the rapid equipment of the French Expeditionary Corps of two infantry divisions, which left for Italy in October of 1943. It was followed in the spring of 1944 by two other divisions, and in midsummer by the entire renovated French Army, which landed on the coasts of Provence. Thus, it was in North Africa that our fighting forces were really reconstituted.

During the period mentioned above, the Free French Forces, together with the British divisions, took an active part in the advance and were assigned, while still protecting the southern flank of the Allied push eastward, the mission of occupying the oasis of Bir-Hakeim. From 27 May to 11 June 1942, the French garrison offered magnificent resistance to the enemy. Then our decimated units had to retreat from the field of battle and were reorganized in the vicinity of Cairo, where they were provided with modern equipment. On 25 June 1942 two French brigades participated in the battle of El Alamein. In January 1943 a third brigade was to reinforce them in the Tobruk region. In the meantime, a column left Lake Tchad in the heart of Africa and, after having successively seized Mourzouk and Koufra, succeeded in intercepting the last line of communication between Tripolitania and Abyssinia.

In March 1942 a second column also left Lake Tchad; and Colonel Leclerc who had thought out the operation previously, assured the conquest of Fezzan through a bold maneuver. Lastly, in December 1942 a motorized column crossed the desert of Tibesti and arrived in Tripoli in February 1943. Here it joined the British 8th Army after the mopping up of the oasis of southern Tripolitania, and on 18 March 1943 established contact with the French troops from southern Tunisia (*méharistes* [camel troops] of General Delay) at Ksar Rhilane.

These operations characterize this period of the Free French Forces. It was fitting that they should be reviewed, and that credit be given to these little units scattered over the African continent. In spite of insufficiency of numbers and their outmoded equipment, they won the admiration of the Allies and made possible the creation of the new French Army, which was to take its place alongside British and American troops in the great battle to come.

During the night of 7-8 November 1942, the Allies began their landings in Morocco and Algeria. The meticulous and secret measures for recruiting and mobilizing a force of 80,000 reserves by the end of 1942 made it possible for the African Army to increase

its strength from 120,000 to 200,000 men by the spring of 1943. On 18 November 1942, on orders from General Juin, the Tunisian troops at Medjez-el-Bab rejected the ultimatum of Nehring, the German general. On the next day they rejected that of Marshal Kesselring, and opened fire on the German forces. The African Army had re-entered the war.

Many battles were fought during the course of the winter of 1942-43 in the defense of the Tunisian ridges. The conquest of the Protectorate and the insufficiency of the matériel available at the time explains the difficulties encountered by the Army in the execution of the missions assigned to it, as well as the slowness of the operations. After suffering severe losses, however, it finally fulfilled its mission. Seventeen thousand dead marked the route from the frontier to Tunis. This proves that the Army—as General Anderson, commander of the British 1st Army, said in an order of the day—never ceased to fight "in accordance with its great military tradition, reviving on the Tunisian soil the glories of France."

In the spring of 1943, three North African divisions reinforced the Free French Forces. The summer was spent in organizing the 300,000 men of the Free French Forces in Africa and equipping them with modern weapons. This was the prelude to the deliverance of Corsica by French forces and Allied naval and air support. It was followed by the capture of the airdromes of Aléria, which brought about a reversal of the air situation in the Mediterranean and ended the bombing of Algerian ports by Axis planes, besides providing the Allies with good airports. After the fall of Pantelleria, the conquest of Corsica was assured. It had been prepared by the patriots of the island, who greatly aided in the task. The task was hazardous, since the 100,000 enemy troops that occupied the island had organized the terrain defensively. The revolt of the island in September 1943 was skilfully exploited by our landing troops. An assault battalion, immediately transported to Ajaccio, was followed by a Moroccan mountain division (a regiment of Algerian rifle troops and Moroccan Spahis), and later by a Moroccan cavalry group. Their means were inadequate from the point of view of matériel—a few animals, jeeps, and other vehicles. In this mountainous region the men had to haul their equipment on their backs. But, in spite of difficult conditions, the operation was successful, and on 5 October Bastia was free. This operation was entirely French.

During the course of the bitter fighting in Italy at the Belvedere and the Gustav Line, two French divisions distinguished themselves by their fine military qualities. Their heavy losses, however, required their reorganization and reinforcement by two divisions, one of which was the 1st Free French Division. These units constituted the French Expeditionary Corps which, under General Juin, joined the American forces. The offensive which began on 11 May achieved the victories of Mount Mayo, the Liri, Rome, the 4th of June, Siena, the 3d of July, and the breakthrough of the enemy front. General Alexander, Commander in Chief of the Mediterranean Theater of Operations, in his order of the day of 18 July 1944, recognized the courage of the French Army in Italy.

On 17 June 1943, the 9th Division of Colonial Infantry, reinforced by a commando group and a group of Moroccan cavalry, supported by heavy batteries and naval units, all under General de Lattre de Tassigny, landed in Elba, and captured the island after fifty-three hours of fighting.

The recognized French Army, newly equipped and armed, from then on was able to fulfill its basic mission—the liberation of the soil of France. It had proved its worth and ability on the field of battle in North Africa and in advances through Corsica and Italy.

The French Forces also performed creditably in the last Allied offensives in the west, where their coordinated efforts and simultaneous frontal attacks proved their efficiency. Their participation in the Colmar maneuver which liberated Alsace, the conquest of the left bank of the Rhine, the breaching and crossing of the Siegfried Line, and the rapid

march across Holland, the plains of Westphalia, the Palatinate, and the Black Forest, thus opening the way to Berlin and the heart of Germany, were proofs of their competence.

The new French Army has been able to adapt its military traditions to the requirements of modern war. France shares, with her faithful Allies, the common triumph.

Some Aspects of Direct Air Support

Translated and digested at the Command and General Staff School from a Russian article by Colonel N. Denisov in "Krasnaia Zvezda" (Red Star) 1 August 1945.

This article deals with a number of questions connected with the operations of bombers, Stormoviks, and fighters in the support of infantry and armor in the hostile rear following the breaching of the enemy's positions throughout their depth.

Experience has shown that successful air support depends, to a large extent, on the timely preparation of all the links in the chain of cooperation, from senior commanders and their staffs on down to the small units and individual soldiers.

The establishment of cooperative action is carried out in combined exercises, in command and staff maneuvers, and in tactical field exercises. The emphasis is placed on the acquisition by officers (air force and tank) of practical methods for the conduct of well-coordinated operations. Each point in this cooperation, as enunciated in the plan and worked out on the map, is thus learned in practice.

Let us assume, for instance, that a tank officer entertains doubts relative to the efficiency of a prearranged signal as given from the ground. He then has the opportunity to go into the air and personally convince himself that the signal answers the requirements of being visible from the air. In their turn, air officers learn at armor training grounds what tanks are able to do at the moment of a Stormovik attack, and verify from the ground the possibilities of the most effective utilization by tanks of various maneuvers carried out by the air forces. All this practical work is combined with thorough planning of coordinated action, in which not a single detail is passed over without consideration. Having worked together, air and armored units find themselves, during the course of an operation, in the possession of a common language, and are not, therefore, obliged to waste time in working out every problem of coordination or synchronization.

In considering the subject of air support, it would be erroneous to assume that the mission of the aviation supporting mobile ground forces amounts, essentially, to the delivery of blows from the air on those objectives which directly hinder the advance of the attacking force. Such a conclusion would be too limited, and out of harmony with the spirit of a modern offensive operation. If the mission of fighter aviation is to expel enemy planes from the area where the operation of the mobile group takes place, it is then the mission of the bombers and Stormoviks, in aggressive operations, to crush the enemy in the decisive direction in order to create the most favorable conditions for the maneuver. The operations of the Nth Air Force, which supported our mobile forces engaged in a breakthrough operation at one of the Vistula bridgeheads, are interesting in this respect.

At the beginning of the attack on the main zone of the German defense, a considerable part of the air force which was assigned to accompany the tanks flew out to destroy the targets (both reported in advance by reconnaissance and newly discovered) along the axis of the proposed maneuver. For the most part, the planes engaged in such operations were Stormoviks, and these delivered blows on enemy motor columns, reserve concentration areas, various dumps, bridges, etc. The sector in which these blows were delivered was divided, through its depth, into a series of zones corresponding to specific groups of planes.

At first, the tank group committed in the breakthrough met with insignificant resistance by the enemy, who had already been demoralized to a certain extent. There were, however, two serious obstacles ahead of the tanks: another German defensive position and a powerful reserve group. The latter was getting ready, evidently, for a counterattack against our flank. Under these circumstances, powerful blows had to be delivered against the enemy's defenses, a steady watch had to be maintained over the maneuvering enemy group, and action had to be taken against this group from the air.

In the given case, the action of the air force did not seem to be directly connected with the action of the tanks, for the targets subjected to aerial attacks were as yet several kilometers away from our tank group. Nevertheless, regarded from the point of view of the existing situation, this sort of operation was very effective. By the time our tanks arrived at the enemy's defense line, the latter's solidity had already been somewhat impaired by the action of our bombers. The support of the tanks attacking this obstacle immediately assumed the form of direct air support. On the appearance of our planes, they were directed to their targets by the commanders of the tank units through the use of previously arranged signals, and the enemy's fire system was definitely crushed by a few concentrated attacks of our bombers and Stormoviks.

The battle with the German reserve group developed in approximately the same way. At first, its activities were placed under uninterrupted observation. The method of observation itself is worth noting. The so-called "relay method" was used, in which the crews of the reconnaissance planes informed one another, as they relieved one another in the air, of the objects to be watched. In practice, this was done in the following manner. The plane arriving in the reconnaissance area received by radio from the crew that was being relieved all principal observational data and the main reference points. Thus the new crews were not obliged to waste time in a search for targets to be observed. The plane going off duty passed through a special post on the way back, and transmitted to the senior tank commander the latest reconnaissance data. The relay method of observation, even though it required a somewhat extensive outlay of forces, resulted, nevertheless, in a great clarification of particular situations. Owing to the fine organization of the air reconnaissance, the joint blow of our armor and air force on the German reserve group was very well timed. The Germans preparing a counterattack on the flank of our forces were themselves subjected to a flank attack, and our armored group again gained still greater freedom of maneuver.

The air force commander supporting the ground forces in the enemy's rear areas may find himself faced with a great diversity of unexpected missions. This requires a correct expenditure of forces and means, and the creation of a permanent reserve. Such a reserve of bombers, Stormoviks, and fighters must be ready at all times to deliver a sufficiently powerful blow on a suddenly appearing enemy group or to repel an unexpected air attack. It is extremely unprofitable to maintain a large reserve over periods when the situation is comparatively quiet. And this is the more true for the reason that when ground forces advance rapidly, units engaged in displacing their bases are not able to participate in the operation during a certain length of time.

In this connection, the method of constituting a reserve force employed by an air force unit of the 1st White-Russian Army Group was quite interesting. In the organization of the air support the idea of the establishment of a permanent reserve group was entirely abandoned. But when the commander of the unit wanted to rush a group of planes into the battle, he had such a group ready to take to the air immediately. Where did this reserve come from? The fact is that the senior commander, though allowing the various units full initiative in working out their combat missions, required the

presence at all times of a certain number of planes at the airfield ready to take off to attend to missions arising unexpectedly. These were not special groups kept on duty as reserve. Inasmuch as the combat work of air units attacking the enemy in groups was echeloned in time, any unit present at the airfield could be looked upon as a reserve. Oddly enough, this method did not interfere with the previously assigned missions. It is obvious that this method of handling the reserve question necessitated an exceptionally efficient system of communication and an intuitive sense of the situation. This method did not, by any means, preclude the establishment of a special reserve when circumstances required it.

Air support of ground forces maneuvering in the enemy's rear areas requires correct organization of control of air units. It is especially important to secure fully the operations of the leading ground elements breaking the way for the main body of the attacking force. This consists, essentially, in the protection of the leading elements against counterattacks by enemy aircraft, and in the action of the Stormoviks assisting the ground forces in overcoming the various obstacles. Briefly stated, we have here a direct (tactical) air support. The activities of fighters and Stormoviks engaged in this action should be characterized by very broad initiative on the part of their commanders, and by close contact with the leading ground units. In an air unit operating near Berlin, a special advance guard was established. The fighter units and Stormoviks comprising this guard operated mainly at the call of the commanders of the supported ground units. The senior air commander contributed in every way to furthering the initiative of the officers of the group and at the same time gave careful attention to the prompt delivery to it of its fuel and ammunition supplies.

The advance guard is able successfully to accomplish its mission only on the condition that its officers give attention to the matter of searching for landing strips suitable for combat work. Advance guard units, without waiting for the construction of actual airfields, made combat sorties using only short and narrow dirt runways. Level stretches of highways were also used for this purpose. Initiative such as this created favorable conditions for the launching of unexpected strikes upon the enemy.

The commander of a pursuit must be imbued with a resistless will to destroy, and this must be felt down to the last man. Without regard for their neighbors, or for their communications, everybody and everything must push on after the fleeing foe. The artillery and heavy infantry weapons will pursue him with their severest fire as far as their ranges will permit, after which they too will follow on. The infantry, with its lighter weapons, will keep in contact with the enemy, and must never let him go. Darkness and difficulties of the terrain must not be allowed to check the pressure of the pursuit for a moment. Reserves will be thrown in where progress seems to be the greatest, or where it begins to make itself felt.

—Colonel Herman Foertsch, German General Staff, in *Art of Modern Warfare.*

Our Weapons in Winter

Translated and digested at the Command and General Staff School from an article in French by Captain R. Gallusser in "Revue Militaire Suisse" February 1945.

AT the time of the last maneuver at the Petite-Scheidegg and the Jungfraujoch in January 1945, we were able to draw a few interesting conclusions on the subject of the use of our infantry weapons in cold weather. Careful maintenance service, performed in accordance with certain very simple principles, rendered most effective the functioning, as well as the accuracy of fire, of all our weapons.

To prevent breakdowns due to the formation of frost and hardened grease on metal surfaces, the maintenance service must be performed in the open, at outdoor temperatures, and not in a heated room.

All the surfaces of firing pins, gun breeches, and moving parts are coated lightly with a mixture of two parts kerosene and one part lubricating oil. When the weather is very cold, one must not hesitate to increase the proportion of kerosene, in order that the mixture may remain quite fluid and not be in danger of hardening when it comes in contact with the metal. The use of gun oils is to be avoided before opening fire.

Even the grease rings of the shells may cause trouble in a cold cartridge-chamber by preventing the breech from locking completely. It is well to remove the grease from the first cartridges in the magazines of automatic rifles, or, in the case of machine guns, from the ammunition boxes. The rifleman should do the same in the case of his weapon. This was also found to be true in the case of the mortar projectile.

As soon as one is through firing, before the weapon has had a chance to cool off, its moving parts are removed in order that they may be cleaned. This prevents snow, ice, and the water which results from condensation from damaging the weapon. Before the weapon is reassembled a rapid application of the kerosene-lubricating-oil mixture, by means of a brush, will assure positive and correct functioning. One must avoid laying or placing an automatic rifle or a machine gun in the snow, especially during or after firing when the weapon is warm.

When the tactical situation permits, it is well to keep bolts and locks in one's pocket, wrapped up in a clean rag. Of course, this will require more time in preparing to open fire. While in a state of alert, this supplementary precaution may be dispensed with, and the weapon kept ready for immediate firing. In such a case, it is well for the assistant gunner to keep a spare bolt or lock in his pocket, in order to deal with the weapon speedily and with certainty, in case it ceases to function.

When automatic weapons are transported, they may be wrapped with good wrapping paper, a tent square, or white camouflage-sheets in order to protect them against the infiltration of fine snow and frost—especially when the wind is blowing.

The water jacket of the machine gun must be left empty. The stopper of the opening by which it is filled must be removed shortly before firing. Water is added a little at a time after the first bursts have been fired and the barrel and moving parts are quite warm. As soon as firing has ceased, the water jacket must be emptied in order to avoid freezing. If fuel alcohol is available, a mixture of three parts of water to one part of fuel alcohol, or any other good antifreeze product for motor vehicles, is satisfactory. But these products are rare, especially in the mountains, where fuel alcohol has other uses.

The new machine-gun accelerator has given good results. As a result of better utilization of the force of the explosion, the recoil, and the driving spring, the rate of fire may be raised to around 600 shots per minute. The stoppages caused by friction of the various moving parts are more easily overcome, and the weapon, once well adjusted, fires without giving any trouble whatso-

ever. This new improvement, however, does not solve the tactical problem, which requires a modern weapon greatly reduced in weight and of a much higher rate of fire. The mortar, the weapon that is so indispensable in the mountains, has also given an excellent account of itself under conditions that were far from favorable.

A position had been chosen on a glacier that was deeply covered with snow. After digging a hole two meters in depth, we were obliged to be content with a foundation of tamped snow, which was none too solid. But, after the first few shots, the base plate became perfectly stable and dispersion was wholly unaffected.

In order to avoid trouble within the weapon, or an abnormal dispersion that might occasion serious results, the tube, as well as the driving rings of the projectile, should have the grease carefully removed from them. After firing, the tube, as well as the firing-pin group, must be thoroughly cleaned. Then they should be lightly coated with the kerosene-lubricating-oil mixture, as in the case of the other weapons.

When snow is being driven by the wind, it is better not to remove the muzzle cover, except for firing, and to replace it immediately after firing has ceased.

When compared with shells, mortar projectiles have given very unsatisfactory results. This is to be explained, perhaps, by the large amount of friction between this ammunition and the tube.

Among personal weapons, the Model 31 carbine, the Model 43/44 (Suomi Model) submachine gun, and the Model 43 hand grenade, have proven to be very satisfactory, even under the worst atmospheric conditions. Their functional speed makes them ideal weapons for the sentinel who is exposed to bad weather and surprise attacks.

For close combat, even in cases where the combatant is obliged to crawl or roll in the snow, the weapons can be used instantaneously, without the necessity of spending a long time in cleaning them. With a little care and practice, the soldier can easily learn to avoid stopping up the barrels of his weapons.

In newly-fallen snow, type OHG 40 grenades should not be used. They are not sufficiently sensitive and frequently fail to explode, because the jolt resulting from striking is deadened by the layers of soft snow. Its light weight, its small volume, and its instantaneous percussion system, however, make it an ideal weapon for fighting on a bare, rocky surface, or on a barren summit where other grenades with time fuzes often roll a long way before exploding.

The defense positions constructed on the Jungfraujoch, during the coldest part of January 1945, were held for many consecutive days. During this time, many periods of firing occurred in which intervals, from the time of the alarm to the opening of fire, were noted. In the case of the automatic rifles, one could count on less than ten seconds; for the machine-guns, forty-five seconds when it was necessary to replace the locks, and about fifteen seconds when these were already in place.

The temperatures varied between −10° and −20° centigrade [14° and −4° Fahrenheit]. Maintenance services were performed in the positions and in snow shelters hollowed out in the crevasses of glaciers.

No one is more disciplined than I am, no one is more strict in fulfilling his military duties, and for these same reasons there is no one who believes more than I do that under no circumstances should passions supersede the laws.

—Marshal Antonio José de Sucre, quoted in *Revista del Ejército, Marina y Aeronáutica*, Venezuela

Employment of Smoke in Attack

Translated and digested at the Command and General Staff School from a Russian article by Lieutenant Colonel Isaiuk in "Krasnaia Zvezda" (Red Star) 10 July 1945.

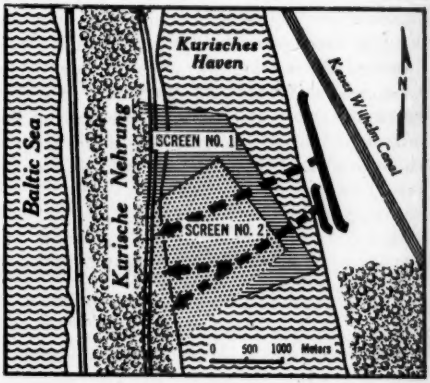
DURING the Patriotic War, the Red Army often employed smoke screens in offensive operations. Smoke screens were used primarily for blinding enemy strongpoints and observation posts, concealing our movements, and confusing the enemy as to the direction of the main attack.

Experience has shown that units attacking under the protection of smoke suffer considerably fewer casualties, and that the success of such attacks depends upon their timing. If timing is wrong, the enemy will have visible targets for his fires and the smoke screen will be wasted.

The following is a typical example of the employment of smoke in forcing a crossing of a river. Pursuing the retreating enemy, we had reached a river. Our attempts to force a crossing without halting the pursuit failed, for the enemy had succeeded in organizing his new position. His fires and counterattacks prevented us from establishing bridgeheads on the western bank. It was then decided to employ a smoke screen. Smoke was to be generated on two sectors, each stretching for about one kilometer. The purpose of the smoke screen was to blind the enemy's strongpoints and his direct firing artillery pieces on the west bank, and to conceal the crosing units and the tanks preparing to cross the barrier.

The wind direction was quite favorable. After laying a smoke screen, the infantry began crossing to the west bank. The enemy's weapons could not fire effectively, and that gave our units the opportunity to establish two bridgeheads and to cross the tanks.

In operations of this type, it is particularly important to blind the enemy's strongpoints and his artillery observation posts. To do this, clouds of smoke should be placed directly over the enemy's positions. In this method, the effectiveness of his fire is decreased to a greater extent than in placing the smoke over our units. This blinding can be best accomplished through the employment of artillery smoke shells. Under favorable weather conditions, however, this can be done with the aid of smoke-generating pots. The following example will illustrate this point (see sketch).



When the Red Army reached the Baltic Sea, considerable German forces near Memel were cut off from East Prussia. Most of their supplies had to pass through the strongly fortified Kurische Nehrung, [a narrow tongue of land separating Kurisches Haven —a large, shallow lagoon—from the open sea], separated from Memel by a narrow strip of water. From the hills on this tongue of land, the enemy kept the opposite shore of the lagoon under close observation.

The original plan of our command called for establishing a bridgehead, widening it, and finally for cutting off the route of retreat for the Germans in the north. In accordance with this mission, our reconnaissance groups and leading elements began advancing over the ice of the lagoon from the point about ten miles south of Memel. But the enemy used flares to illuminate the

lagoon, conducted effective fires, and prevented our troops from approaching their objective.

It was decided, therefore, to cross the bay in daytime under the protection of smoke. In the morning, a smoke screen was laid from the line established on the ice of the bay (smoke screen No. 1). This secured the approach of our leading elements. Wind direction favored the operation. A uniform smoke cloud had concealed the bay and blinded the enemy's defenses to a depth of two kilometers. Smoke generators were active for an hour and a half. Deprived of observation, the enemy could not stop our leading elements which were advancing also through the smoke. As a result, our troops captured a bridgehead and dug in. Next morning, also under the protection of smoke, our main forces crossed. To conform with the situation, the frontage of the smoke screen was broadened to measure about two and a half kilometers (smoke screen No. 2). Our troops widened the bridgehead and cut across to the open sea, thus blocking the retreat route from Memel.

It should be noted that in the foregoing example the enemy kept firing on the line where smoke was being generated. These fires, however, were ineffective. This example shows that an attacking force employing smoke is able successfully to solve difficult problems wthout suffering serious losses.

Experience also shows that smoke screens are most effective when employed in conformity with the situation. When using smoke, cooperation among chemical warfare unit, infantry, artillery, and tanks must be carefully organized. The organization of artillery observation and the functioning of communication facilities must be faultless.

RAF Bomber Command

Digested at the Command and General Staff School from an article in "The Fighting Forces" (Great Britain) August 1945.

MANY details of the air battles fought in darkness over Germany by the strategic bombing force of RAF Bomber Command have had to remain secret to avoid helping the enemy, but now it is possible to give some account of the five-and-a-half years' struggle. At the same time, with the occupation of Germany it has also become possible to understand more clearly than before the full scope of Bomber Command's achievement.

At the beginning of the war, in 1939 and 1940, Germany had no night-fighter force. The defense of Germany, against a bomber force which the enemy knew to be weak, was entrusted to antiaircraft guns and searchlights. This was reasonable on the hypothesis that Germany would expect to win the war outright long before the Allies in the West could bring up any considerable bomber force. In the early summer of 1941, when the Battle of Britain had deprived Germany of the hope of final conquest in the West and the invasion of Russia was projected, some better defense had to be organized against the increasing threat of bombing from bases in England.

So began a course of action which profoundly modified the whole strategy of the German Air Force. At this time, in June 1941, Germany had a force of 1,500 bombers, largely designed for cooperation with the German Army, though used in the previous winter to bomb London and other British towns. Next year, in June of 1942, the enemy still had a force of 1,500 bombers. But by June 1943, the enemy's twin-engined fighter force had risen to 530 and there was a corresponding decrease in bomber strength, which now stood at 1,300 aircraft. By September of 1944 the enemy's strength in night fighters and bombers was roughly equal, about 800 of each. But in actual production of aircraft there had been a much greater

shift than the figures would suggest from bomber production to night-fighter production; the bomber strength remained at a high figure because the aircraft were seldom used in operations after 1942, and the front-line strength was maintained by a policy of conservation. It is a paradox of the war that the night bombing of Germany defeated the German bomber force even before the enemy's aircraft industries had been reduced by air attack. The strategic importance of the German Army's loss of all bomber support can hardly be exaggerated; the weapon which made the blitzkrieg possible, from 1939 to 1941, was struck from the enemy's hands. The enemy would have been fully justified in exchanging an offensive for a defensive weapon if this had in fact made the night bombing of Germany impossible. And at first it must have seemed to the enemy that he had a fair chance of succeeding in the policy of attrition against Bomber Command. In 1941 Bomber Command's casualty rate was 2.5 percent of all sorties; in 1942 it had risen to four percent and the night-fighter strength was due to be more than doubled by 1943. During 1943 the great expansion of Bomber Command's force was to occur, but if the night fighters could shoot down a larger percentage, and not a very much larger one, than in 1942 the result would be either that the expansion would never occur or that operations against German industry would have to be infrequently carried out. Two to three hundred four-engined bombers were being produced every month, and if forty bombers could be destroyed in each major operation, and if there were to be six major operations a month, any great access of strength would be unlikely. Such a result was by no means improbable; the Battle of the Ruhr, from March 1943 onward, was not fought without heavy casualties and the German night-fighter force was becoming not only stronger but more efficient.

From 1941 onward a great number of stations had been built up throughout Germany to control the night fighters; the enemy had also an efficient early-warning system. With experience, cooperation between the night fighters and these ground stations became more and more effective. The first answer to this system was to concentrate the bombers in time and space during their journey to and from the target; this difficult navigational feat became increasingly easy as navigational aids were developed. Such concentration meant that at any one time only one or two ground control stations linked to a comparatively small number of fighters had the bomber stream within range. On the whole, increased concentration along the route balanced the increased efficiency of the German defensive system; the casualty rate in 1943 fell from four percent to 3.7 percent.

After this battle the enemy's first reaction was to send the fighters to intercept the bombers over the target instead of to attack them whenever they were within range of the ground control stations. A single-engined night-fighter force, with a strength of about 350 aircraft, was also developed to intercept the bombers over the target; with the new system, aircraft of shorter range than the twin-engined fighters had a chance of intercepting. But there was always inevitably a lapse of time before the fighters reached the target that was being bombed; the bombers were comparatively immune from attack during the first quarter of an hour or twenty minutes, but then the fighters began to arrive in large numbers. Bomber Command's reply was to increase the concentration of the bombers, both in time and space. Instead of the bombers coming over the target at a rate of about 800 an hour, they now attacked at a rate of about 1,800 an hour, and were generally on the homeward run before the fighters arrived; no attack now took longer than fifteen to twenty minutes; and, to make doubly sure, feint attacks were carried out, and at the same time the bombers were so routed as to suggest to the enemy that they were approaching a target which, in fact, they did not bomb.

When the enemy found that he could seldom get his fighters to the bombers' target

in time, he improved his methods of plotting the course of the bomber stream overland and aimed to get the fighters into the stream as soon as possible after the bombers had made landfall. The fighters were then to keep in the stream all the way to the target and back again to the coast, making as many interceptions as possible. This plan was very dependent on the efficiency of the early-warning system and on basing the fighters over a wide area so that they could converge from all directions on the bomber stream. It proved an uncertain method, but if the fighters did succeed in getting into the stream, and if the weather or other conditions were suitable for interception, more bombers were shot down on these few occasions than in any single night before. Casualties were very heavy on certain operations, though the overall casualty rate did not increase; the heaviest loss of all was on the night of 30 March 1944, when ninety-six aircraft were missing out of a force of about 800 attacking Nuremberg, but only nine were missing out of a force of more than 700 attacking Essen on the night of 26 March 1944.

Vigorous measures were at once put in hand to oppose these new tactics. Experienced Mosquito night-fighter crews, originally trained to operate with Fighter Command over Germany against enemy bombers flying to attack this country, flew with the bomber stream and shot down or chased away the night fighters. The number of feint attacks was also increased, and by the time the Germans discovered which were the genuine targets it was usually too late to send the fighters to the real bomber stream. The bombers engaged in these feint attacks were widely dispersed in space and could take incessant and complicated evasive action, and because of this their casualties were light, even when they had the greater part of the enemy's night-fighter force flying with them and after them. The tactics of putting the night fighters into the bomber stream was the enemy's last serious attempt to defeat the night bombers by attrition. Henceforth the night bombers kept the upper hand.

Bomber command flew 100,000 sorties by night during 1944, and losses were only 2.2 percent. This marked improvement over 1943 was largely due to ingenious tactics and scientific devices, but the arrival of the Allied armies on the German frontier in the early autumn was another very serious blow to the enemy's early-warning system.

Furthermore, there were other advantages to be gained from "mass" as opposed to formation flying. Antiaircraft fire is less effective against bombers flying in a stream. Another advantage is that bombing by aircraft flying in a stream is far more accurate and concentrated than bombing by aircraft in formation.

The complete air superiority gained for the landings in France also enabled Bomber Command to operate in great strength by day. Although the loose stream of night bombers was not easy for fighters to protect in daylight—Bomber Command's crews had never been trained to fly in formation and their aircraft were necessarily dispersed over a wider area than the heavy bombers of the U.S. AAF—there was now little chance of the enemy's day fighters risking combat unless the bombers went far into Germany and beyond the range in which Allied air superiority was absolute. As the Allied armies advanced, Bomber Command was able to make daylight attacks deeper into Germany, but all really long-range attacks were made by Bomber Command in darkness until the end of the war with Germany.

By 1941, as has been said, the Germans recognized that the antiaircraft gun could not be their main defense against aircraft flying high and by night. But this does not mean that flak was not, at all times, a serious danger to the bember crews, or that the enemy ever ceased to protect his industrial cities and other targets with great numbers of guns even when these were urgently needed by the Army. But losses from enemy flak during the main bomber offensive of 1943

onwards were never heavy enough to affect the issue of the war of attrition between the night bomber and the German defenses; flak only accounted for a high proportion of the casualties during the first two years of the war, when Bomber Command was inadequately equipped. Thus during 1942 losses from fighters and flak were about equal, though the fighters were probably already causing a few more casualties than the anti-aircraft guns. But in 1943 seventy-five percent of Bomber Command's losses were from fighters and twenty-five percent from guns.

From 1942 onwards, concentration in time and space did much to reduce casualties from flak. A gun can only engage one aircraft at a time, and the more bombers overhead at any given moment, the smaller the proportion of the total force that can be hit. Shooting into the "crown" of the concentration is never effective, but this method of defense was forced upon the enemy because the concentration of aircraft made it impossible for the enemy to pick out a single aircraft for attack.

With air superiority by night the tactical problems of night bombing were very far from exhausted. It may now be said that in 1940 there was cause for grave anxiety about the results of our night attacks; only the most experienced crews were then able to find the target in darkness and a bomber force, as was projected, of more than a thousand aircraft could not be entirely manned by men of exceptional ability and years of experience. But as soon as the facts were fully understood, after a careful analysis of photographs taken from the aircraft during bombing, British science provided the answer; the first navigational aid used by the RAF was, in fact, already in existence before the war, though the application of it to night bombing had not been then considered. Throughout 1941 the work of experiment and training went on, and by the spring of 1942 Bomber Command was ready to solve the problem of really accurate bombing of large industrial areas by night, by large numbers of aircraft and against heavy defenses.

It so happened that the answer to the problem of finding the target was also the main answer to the enemy's defenses. Unless the navigator could tell where he was within a mile or so in relation to the target at any moment of the flight and could therefore see that the speed of the aircraft was adjusted to a precise timetable, it was impossible to achieve concentration of aircraft in time and space. And so the same device which allowed the navigator to find the target on a dark night made possible the planned and concentrated attack which, because of the growing strength of the night-fighter force, had become essential by 1942. The first attack of the war to be planned minute by minute in this fashion was carried out just before the general use of navigational aids. This was the attack on the Renault works on the night of 3 March 1942. It was far more rapid than any previous attack of equal weight and every stage of the flight of every aircraft was planned and timed in advance. It was also the first obviously successful large-scale attack by night. But here a brilliant moon was the navigational aid, and it was one thing to operate over France and another to operate against all the German defenses in such weather. The first large-scale attack with navigational aids was made a month later, against the port and U-boat center of Lubeck, and the efficiency of the new methods was proved when the first German industrial center went up in flames. For the concentration in time and space which navigational aids made possible in all weathers, which was necessary if all crews were to reach the target during the period when picked crews had made it visible by flares and fires, and which was essential as a protection against night-fighter attacks, was also the answer to the passive defense of targets in Germany; the fire brigades were completely powerless when enormous numbers of fire bombs were dropped within as short a time as half an hour. Seldom can a scientific invention have had a more profound effect on tactical development and, indeed, on the whole strategy of the war. For these new tactics were developed at a time

when the only conceivable offensive action against Germany in the West was to bomb the enemy's war industries.

The thousand-bomber attack against Cologne was a test, on an even larger scale, of the new tactics which navigational aids made possible. And it would, in fact, have been impossible to dispatch a force of this size without these aids. A force of 1,000 bombers could not have been handled at all unless the route and timing of each single aircraft could be arranged to the mile and the minute according to a predetermined plan. No other air force in the world could, at that time, have used anything like so large a force in a single operation.

In spite of the great successes of 1942, the further development of navigational aids, and the formation of the Pathfinder Force during that year, it was not until 1943 that Bomber Command was sufficiently strong in four-engined aircraft to begin the main offensive against German war industry. And it was also in 1943 that the U.S. AAF was ready to begin its strategic bombing campaign against targets in Germany. The joint plan of campaign was largely dictated by the equipment and training of both Air Forces and, as is well known, the obvious decision was made to attack the large industrial areas by night and the single war factories by day.

Clear proof of the strain to which the German aircraft industry was subjected by strategic bombing is provided by the enemy's decision made in 1943, to concentrate almost exclusively on single-engined aircraft, which naturally could be produced more economically than two-engined or four-engined aircraft. Their single-engined aircraft were to be used, not only for the air defense of Germany but for the protection of the army, and for ground attack on the Allied armies and their communications; there were to be few, if any, actual bombers. But it is a significant fact that even in 1945 two-engined aircraft for use as night fighters were still on the production list.

Both Von Rundstedt and Kesselring have said that the main reason for Germany's defeat was the complete air superiority of the Allies. In 1944, General Model, in a *most secret* order issued by the Supreme Command of Army Group B for distribution only down to divisions, said that "Enemy No. 1 is the hostile air force, which because of its absolute superiority tries to destroy our spearheads of attacks and our artillery through fighter-bomber attacks and bomb carpets, and to render movements in the rear impossible."

But the effect of strategic bombing on the actual fighting capacity of the enemy was not a matter of regular progress; production of weapons was not cut in the same proportion as the acres of devastation in the industrial areas increased. On the contrary, the end of production in most war industries came with a rush at the end, as the whole industrial organization suddenly broke under the strain.

During 1943, Bomber Command was largely concerned with perfecting its tactics in the bombing of large industrial areas, but there were some significant exceptions. It was of such exceptional importance to destroy the Peenemunde V-weapon experimental station that a new technique for precision attack by night was used and a master bomber directed the main force by radio-telephone. This was planned as a special measure for exceptional attacks, or even for this attack alone; there were several reasons why it was not thought practicable to use such tactics repeatedly.

But in the first months of 1944, Bomber Command had to prepare for the liberation of Europe, and it was realized that precision-bombing of small targets would be essential for this task. During the first stages of the operation the greater number of targets would be in France, and there would not be the same objection to the use of master-bombing tactics against these as against targets in Germany. Small forces of picked crews accordingly attacked a number of factories in France, which in any case had become of great importance to the German aircraft and other war industries at this stage

of the war, and the new tactics were perfected in a short time; everything was ready by March of 1944 for the bombing of French railway centers which was to prevent the German Army from getting its reserves up to the beachhead in time to prevent the Allied armies from building up their strength. Master bombers were very thoroughly trained so as not to keep the main force waiting, equipment for radio-transmission was perfected, a system of giving instructions by code-words was worked out, and the flexibility of the striking force was proved when it passed immediately from attacking Berlin, the largest target in Germany, to the saturation by bombing of a single marshaling yard.

The most severe of the Bomber Command's tactics of precision bombing came when the RAF was asked to lay what Model calls a "bomb carpet" on enemy troop concentrations within a short distance of our own troops, in order to check a counterattack or prepare for an Allied advance. Such attacks were most often made by day, but also by night, and experience showed that both were equally accurate; the bombing line behind which our own troops were to keep was no nearer the target area by day than by night.

After D-day the commitments of RAF Bomber Command were greater and more varied than ever before, and the flexibility of its tactics was taxed to the utmost. A major campaign against V-weapon sites and supply depots had to be fought, the Command joined in the campaign against synthetic oil plants in Germany, begun by the U.S. AAF a month or two before, naval targets multiplied and had to be frequently attacked to protect our convoys across the Channel, a new U-boat offensive threatened and had to be checked by minelaying and bombing, airfields had to be cratered to prepare for airborne landings, German industrial towns became tactical targets and had therefore to be more heavily bombed than before, Germany's main waterways had to be drained if railway interdiction inside Germany was to be effective, Walcheren had to be flooded in preparation for the battle for the port of Antwerp, direct support for the Russian offensive had to be given by bombing industrial areas in Saxony, block ships had to be sunk out of harm's way before they could obstruct ports which the Allied armies needed for their supplies, and railway viaducts had to be broken down before the Ruhr could be completely cut off from the rest of Germany. The targets ranged in size from a single gun emplacement or a ship to an industrial area of several square miles. The Command began to operate with equal strength in daylight and by night, and efficient Pathfinder tactics had to be worked out for bombing through cloud in daylight, or when the target was covered by dust and smoke. Improved methods of bombing large areas by night were also devised, and it proved in the end possible to use a master bomber many hundreds of miles inside Germany.

Bomber Command's first and last targets of the war were naval, and the German Navy itself and its bases were constantly attacked for five and a half years as well as war industries producing for the German Navy.

Antiaircraft Defense of Large Mechanized Units

Translated and digested at the Command and General Staff School from a Russian article by Colonel V. Shopenko in "Krasnaia Zvezda" (Red Star) 17 July 1945.

IN the war of movement the antiaircraft defense of large mechanized units has acquired singular importance. This is due to the use of large masses of aircraft by the belligerents and to the tactical situations in which these units operate. After a breakthrough, exploitation of success and pursuit are carried out by mobile groups. The enemy, trying to delay their advance, resorts to the use of his aviation. The inevi-

table massing of troops and matériel on the roads facilitates air operations, and the losses of the advancing force may be quite heavy if the antiaircraft defense of the mobile group is not up to the required standard.

The antiaircraft defense of a large mechanized unit should be based on a thorough study of the aerial situation in the area of operations, and special attention should be given to the peculiarities of the enemy's tactics. Depending on the character of combat activities, the antiaircraft weapons may be called upon to accomplish a variety of missions. Let us analyze a few of these.

Experience has shown that enemy attack planes frequently launched their attacks against mechanized units when the latter were on the march. Attacking in narrow places, gorges, and on congested roads, they tried to stop the movement of our units, break them up, upset their control, and inflict losses on our troops and matériel. This was necessary in order that the enemy might gain time for drawing up his reserves and for organizing his land defenses. Under these conditions, if the antiaircraft defense had not been adequately planned, a continuous pressure of even small flights of enemy planes may considerably slow the tempo of advance.

A large mechanized unit moves, as a general rule, along two parallel roads, in two columns, and in most cases at night. The characteristic deficiency in the organization of a march is usually inadequate reconnaissance of the route. A night movement without a strict accounting for the road conditions invariably leads to the disruption of the march schedule, and some of the units may be compelled to move in daylight.

Absence of a rigid system of regulating traffic is another serious deficiency, especially in places which at first may not appear as serious obstacles, such as corduroy roads, gorges, defiles, fords, and narrow stream crossings. These are the places where, during breakthrough operations, congestion of troops and matériel often occurs. Here, the sequence of troop movement does not depend so much on the predetermined schedule as on the rank of the senior officer in the column. Tanks, vehicles, and guns may be stretched out in several files, presenting a perfect target for the enemy aircraft.

This can be avoided by the timely posting of traffic-control men, supplied with some communication means, on the approaches to such places. Congestions will still be unavoidable. They will be smaller, however, and it will be easier to protect them successfully from aerial observation by camouflage or concealment in the nearest wooded areas.

The most successful allocation of antiaircraft weapons during a march is the one in which each independent column is given one antiaircraft battery in addition to its organic weapons. It must also be remembered that a battery on a march may be caught in a traffic jam, and being clutched in a column, will not be able to deliver effective fire. In some cases the situation is aggravated by terrain features, trees, or buildings in the area of action. The batteries, therefore, should be given freedom of maneuver by allowing proper distance between them and the columns ahead. This distance, depending on road conditions, should be no less than 150 to 200 meters.

Combat Regulations for tank and mechanized units of the Red Army require the organization in the column of air observation posts and the establishment of special air-raid signals. All fire means should be used to conduct fires on the descending planes. These regulations, however, were not always complied with: air observation posts were not established, air-raid warning signals were not sounded, and only the small-caliber antiaircraft batteries engaged the enemy planes. This should not be tolerated, for a well-timed warning throughout the column and the utilization of all fire means compel the enemy to attack from higher altitudes and affect the accuracy of his bombing.

Antiaircraft security on the march is not always accomplished by assigning antiaircraft weapons to the units. In certain cases, when the hostile aviation is active and when

road conditions are poor, or when the column moves over corduroy roads, fords, defiles, and the like, it is expedient to have the antiaircraft weapons previously assembled in places where traffic congestions are likely to occur. This manner of regrouping the antiaircraft artillery somewhat weakens the antiaircraft protection of those units which happen to be elsewhere along the route. Nevertheless, it appears quite justifiable, for it prevents traffic jams and "bottlenecks" caused by enemy aerial action.

Armored spearheads and reconnaissance groups should be protected by heavy-caliber, four-barreled antiaircraft machine guns on armored carriers.

The reasons for this type of protection are as follows: In the first place, the spearhead is, as it were, an armored fist. When in contact with the enemy, a small-caliber antiaircraft artillery battery attached to the spearhead is vulnerable to hostile submachine-gun fires and hence is not able to carry out its primary mission. In contrast, the installations on armored carriers have a greater advantage. Secondly, the spearhead, unlike the main body, is a small target and is generally attacked by hedgehopping planes. The fire of the four-barreled, heavy-caliber antiaircraft machine guns is quite effective against low-flying planes, while the 37-mm gun, because of the peculiarities of its traversing and elevating mechanisms, is difficult to handle. If the much greater fire maneuverability of the machine guns is taken into account, as well as their adaptability for ground targets, then the inexpediency of using small-caliber artillery to cover the spearhead and reconnaissance groups becomes evident.

Generally, the results are particularly satisfactory if mutual fire support with the neighboring guns is established through a favorable selection of firing positions. When choosing firing positions, the terrain features of the area should be appraised from the point of view of ground defense, for combat experience has shown that antiaircraft batteries are often compelled to engage ground forces or enemy submachine gunners.

A mechanized corps is not always required to seize a large center of resistance, such as a city, immediately. The latter can be surrounded and held until the arrival of the main forces. In a situation like this, the enemy is forced to use air transports in order to supply the encircled garrison. To bring down these transports, it is best to have the antiaircraft weapons concentrated along probable approaches of the hostile transports, and this is easily determined by observation. To cite an example, when a large enemy group was once surrounded, all landing and dropping areas, as well as the air routes, were first ascertained. A hastily accomplished regrouping, carried out at the expense of the antiaircraft protection of the units, allowed us to concentrate against the transports up to seventy percent of the corps' antiaircraft weapons. As a result, twelve transports with ammunition and supplies were shot down in twenty-four hours.

Here are a few observations on the subject of night defense. The enemy always practiced night bombing, especially of roads leading to the front and of troop concentrations. These flights were made at low altitudes. In the overwhelming majority of cases, the planes could be observed without the use of any lighting devices, since the altitude rarely exceeded 400 to 600 meters. However, The use of the antiaircraft artillery was impracticable because of gun flashes which blinded the gunners. But the use of even a limited number of searchlights alleviated the situation to some degree. It permitted our use of antiaircraft weapons at night, compelled the enemy to alter his night-flying tactics, and forced him to stay at higher altitudes.

On the basis of the foregoing, the following conclusion may be drawn: The success of antiaircraft defense of a large mechanized unit is determined by the correct utilization of all the antiaircraft weapons available. The shortage of these weapons, which is especially noticeable because of the mobility of mechanized units, renders it difficult to furnish adequate antiaircraft protection to troop

concentrations on the march without weakening at the same time the security of other units. It is recommended, therefore, that more antiaircraft artillery be given units engaged in fast-moving actions. This will give the whole antiaircraft defense the necessary flexibility and will materially increase the maneuverability of the antiaircraft weapons.

The Air Battle

Translated and digested at the Command and General Staff School from a Spanish article by Lieutenant Colonel Prado in "Revista de Aeronáutica" (Spain) No. 51, 1945.

THE appearance of the air arm in combination with the motorized troops of the ground forces made of the second World War something entirely different from the World War of 1914-1918. Employed in close cooperation with armored forces, motorized infantry, and other ground troops, it is able to force a rapid development of the battle.

Prior to this war, fire superiority was depended upon for success in attack. Today, air superiority as an indispensable premise of success must be added to this. This necessity for previous air supremacy in undertaking any type of operation, whether ground or naval, is conceded by all competent military authorities, and there has been no hesitation in putting it into practice in any of the campaigns that have been undertaken during the present war. When this air supremacy has not been sufficiently marked, when its attainment has not been possible because of equality of forces or limited possibilities of their employment as a result of unfavorable meteorological conditions or distances that exceeded the limits of efficient employment of aircraft, operations have been either suspended or postponed *sine die* till air supremacy could be attained over the future field of operations.

The air front is not static or fixed, but is in a constant state of change. Its characteristic is constant movement, and the side that possesses air supremacy is able to attack the enemy in front and rear at the same time. The supremacy of enemy air force is conditioned by the process of its concentration in time and space, the same as on the ground. This concentration of formations and of equipment in air operations was first tried out in the Spanish Civil War and has been employed on an enormous scale in the present conflict.

In the campaigns of Poland, of Norway, and of Western Europe, this concentration of air formations cooperating tactically with the forces of the ground army achieved surprising successes. Their tactics consisted of high altitude bombing, low-level attacks, and dive-bombing, which not only surprised the ground forces but also the enemy air forces. Direct bombing by Stukas was, it is certain, the greatest technical surprise of the beginning of the war. These dive-bombers attacked ground objectives or surface naval forces with more efficiency and precision than was possible by means of artillery fire. The method of employment of this new weapon gave the ground army the most positive of support, making it possible for its motorized forces to move at maximum speed, taking the place of concentrations of artillery, which are much slower in movement. By means of dive-bombing, thousands of tons of explosives were dropped on vital points, impeding resistance, disorganizing the enemy's transportation, spreading panic over the front and in the rear areas, leading by the hand, so to speak, from the air, the columns on the ground, which limited themselves to the occupation of terrain prepared for them by the air arm. In addition to this the ground troops were even assisted in their advance over enemy territory through the employment of numerous transport planes, which carried or picked up men, armament, food, gasoline, and a multitude of necessary things.

The air arm exerts an enormous influence on ground operations, and its missions are essentially the following: one's own and the

enemy's reconnaissance, protection of one's own forces, liaison, transportation of supplies, and support.

Air reconnaissance will determine the location of enemy forces and at the same time will note the position of one's own, coordinating its activities with the ground intelligence centers. Air reconnaissance, to be efficient, has need of a certain degree of local air supremacy in order that, in addition to being rapid it may also be accurate, thus preventing mistakes which might be lamentable arising from erroneous or inadequate information. Since air reconnaissance gives but a momentary view of the general situation, it is necessary to impart to it the quality of continuity.

Air reconnaissance also supplements the various forms of protection and liaison. A curtain of planes in the distance and another over one's own forces not only prevent the enemy from dropping his bombs but also definitely prevent (in case of absolute air domination) or at least interfere with his reconnaissance.

When in a war of movement ground forces fight in an isolated position with no flank support, it is the air arm that is assigned the task of supporting these forces. But the superiority of the air arm is mainly manifested on the battlefield, through its operations as a supporting arm, taking the place or supplementing the fire of the artillery.

Bombing attacks do not diminish the importance of the employment of artillery, for in a major offensive even the most intense fires are still inadequate. Nevertheless, the following advantages are to be had from air bombing as a partial substitute for artillery fire:

1. Bombers are located very far back from the front. This renders enemy observation difficult and hinders him in recognizing in advance any preparations for attack.

2. The enormous quantities of bombs required in modern battle do not congest the approaches to the front, since they can be loaded into planes at distant airdromes, while artillery has to be fed in the line of fire itself.

Every offensive preceded by great artillery preparation requires a long time for the accumulation of projectiles, for establishment of observation posts, and for the extension of signal communication lines. Thus, the element of surprise is lost.

4. The employment of air bombing in offensive operations may paralyze all defensive activity and annihilate the advanced troops of the defense.

5. By means of air bombing and machine-gun strafing, enemy artillery may be silenced, the arrival of reinforcements at the front prevented, and the latter isolated from the supply centers in the rear.

6. If the attack is successful, artillery will have to displace forward, which causes its supporting fire to be diminished. This will not happen in the case of aviation since, if adequate air forces are available, their fire support can be continuous, not only by day but also by night.

Air forces, cooperating with ground forces, are able to maintain a constant watch over the battlefield and to intervene whenever it becomes necessary. Preparation of attacks by means of observation and fire, aid in the development of the battle, air attacks on strongpoints, prevention of the arrival of enemy reinforcements, low-flying attacks on forces in the open—all this forms a part of the direct and telling action of the air arm.

The comparison between the quantities of explosives aviation and artillery are able to drop or hurl is a question of little consequence. The former comes out winner over short periods of time, while the latter increases this capacity over long periods. This is due to the fact that air activity is reduced during the night, as well as during periods when it is necessary to return to the airfield to take on more fuel or bombs. Nevertheless, the activity of the artillery is very limited before the battle while the guns are concentrated and fire adjustments are made. The air force, however, is able to operate at all times.

In cooperation with ground forces, air units may be employed with maximum efficiency in a breakthrough operation as follows:

1. Long-range combat.—Combat units ob-

tain air supremacy over the battlefield and maintain this throughout the entire period of action. They conduct patrols at various altitudes over enemy territory, affording indirect protection to bombers. These planes machine-gun convoys, bridges, and highways in the rear areas, as incidental missions.

2. Long-range reconnaissance.—These units will provide information relative to the movements of large formations, the approach of forces from the rear areas, and other diverse activities. They will operate at heights of from 3,000 to 5,000 meters, making use of visual or photographic observation.

3. Tactical reconnaissance.—These units assist in the study of the positions of the contending forces, maintaining a watch over the development of the combat, spying out the firing positions of the enemy, and providing their own artillery with firing data. Their flying heights vary between 1,500 and 3,000 meters. Since the majority of these machines carry bombs, they will participate in the ground operations. Their intervention in these operations is governed by their own observations, and they drop their bombs whenever they find suitable targets.

4. General or counterbattery support.—Heavy and medium bombers have charge of this mission. Their principal targets will be the enemy's heavy artillery positions. As the battle develops, they will direct their attack against the principal zones of enemy resistance, and lastly, they will concentrate on the zones of the principal enemy positions in the rear areas in order to isolate them.

5. Direct support.—Planes employed in this mission follow the ground combat formations, accompanying them during the course of the battle and attacking the immediate objectives that oppose their advance.

Whenever new or unexpected situations present themselves during the course of the battle, the command will employ a certain number of units of various types retained for this purpose. It should be borne in mind that the enemy may attempt to regain air supremacy. Reserve fighter units, therefore, must be ready to take to the air immediately from airfields near the front.

Before the attack, enemy objectives to be destroyed will be catalogued in the order of their importance. During the attack, unforeseen targets may appear which the air forces will have to combat, whether at the request of the ground command or on their own initiative. In the majority of cases, these unforeseen targets will be centers of resistance, strongpoints, antitank guns, etc., which oppose or hinder advance. Here, the closest of cooperation between air and ground forces is necessary.

The organization of this cooperation is the most difficult feature of the problem since the achievement of harmony between such dissimilar means of action requires a knowledge of the situation on the part of the air forces. This can only be obtained through perfect liaison, by scrupulous fulfilment of orders, and through great conscientiousness in the matter of remaining within the bounds of one's own specific functions. This cooperation is facilitated by a copious distribution of schedules in which, in the case of the air force, there will be indicated the order of departure of its various units from their different airfields, the hour of their arrival at the front, the time during which they are to operate over the battlefield, and the time when they are to return.

The general headquarters of large ground units will have a central "air post," or "air liaison post." These posts must be filled by intelligent and energetic persons who are properly suited for the work.

Another fundamental requisite for success is the rapid, simple, and positive designation of objectives to be combated. If liaison is perfect, aviation may be converted into a sort of flying artillery which bombs the targets that are indicated from the ground, with all the rapidity that could be desired.

The load capacity of modern types of planes renders them suitable for long-range transportation of supplies, and when forces are isolated in battle, planes are able to sup-

ply them by way of the so-called "highway of the air."

The transportation of men is the easiest, the greatest difficulty being encountered in the transportation of matériel, especially if it is heavy or of large dimensions. Missions may be as follows:

1. The transportation of forces into battle.—This will be practical when an airfield has been occupied by ground forces or paratroops and it is necessary to intensify the action and feed the battle.

2. The evacuation of wounded or sick.—The return trip to the bases can be utilized for the transportation of combat personnel.

3. Transportation of supplies in general.

The air arm not only fulfills numerous missions that in the past pertained to the artillery, but also modifies the latter's traditional methods. In preparation and direct support fires, the air arm has the mission of destruction, on a grand scale, of definite objectives before the attacks. Modern preparation fire possesses a marked characteristic of suddenness, destructiveness, and an accentuated surprise effect.

Support of the infantry advancing with its armored units assumes the form of a curtain of fire which advances in step with the supported units. It is difficult of achievement, however, because of the natural dispersion characteristics of air bombing. The troops cannot advance without a suitable safety interval between them and the aerial barrage, and it is indispensable that, when aircraft operate in direct support of the infantry, the targets shall be well located to facilitate their destruction before the infantry approaches them.

The air arm in defense.—For the reasons stated above, the employment of the air arm as a substitute for artillery is easier of realization in attack than in defense since its fire power is essentially offensive. It is in defense that artillery assumes the greatest importance through massed fires. Nevertheless, air supremacy should be insured over the battlefield in order that the air arm of the defense may be able to act effectively.

In large-scale counterattacks, if armored units appear, it is highly desirable that the air arm be permitted to intervene in a decisive manner for supplementing the fire of the artillery.

In defense the air arm is at a great disadvantage. Airfields near to the front, where the greater number of planes employed in tactical missions are based, are not only threatened by the enemy's air forces but also by the pressure or advance of his ground forces, especially if the latter make use of any considerable quantity of armored or light vehicles in rapid or deep penetrations. Under these conditions, it is well, as a fundamental measure of precaution, to evacuate the airfields located in close proximity to the front. The employment of planes in place of artillery by the defense becomes, then, very difficult.

The effort must first be made to regain air supremacy before all the air units of the attacker go into action. But this takes time, and such a loss of time may be irremediable in view of the characteristics of modern, high-tempo battle. A great deal of the value of the air arm in defense when used in the place of artillery is derived from its employment against targets which have been carefully studied in advance. But the attacker enjoys the initiative and selects the sector that suits him best, while forces on the defense may not be aware of the changes in their situation that have occurred even within a short space of time. Thus, if the attacker is able to employ massed artillery and air forces for general and direct support, the defender is hardly able to make use of his own for destructive fire at any considerable distance.

The air arm is able to descend in its own particular manner over the enemy's territory, to choose its place of attack, and to make use to a maximum extent of the decisive element of surprise.

Three principal aspects characterize this new method of employment of the air arm: the use of paratroops, the use of gliders, and the transportation of forces by air.

The use of paratroops is already an old

story in the military aviation of many countries. As a starting point for its employment in battle, it made its initial bow in the Soviet Union in the form of extensive maneuvers a few years before the outbreak of the war. Its principal missions are the following:

1. Strategic mission.—Air-landing operations, far in the enemy's rear, on objectives of importance (airdromes, communication centers, manufacturing areas, etc.).

2. Tactical mission.—In the general scheme of the ground operations for the interception of important passes, for cutting off portions of enemy forces, and for contributing to the demoralization of the enemy.

3. Political mission.—Air-landing operations in enemy countries or back of the front; sabotage or agitation of every sort.

Many nations took under consideration these new and special tactics in the employment of aviation, and Germany particularly did not forget the Russian experiments.

In the present conflict paratroop forces have been employed with considerable regularity on all important fronts, where they solved problems that could not be solved by other forces. Employed for the first time, sporadically, in Poland, they reached the stage of decisive and effective intervention in the campaign of Norway, where the airdromes at Oslo, Kristiansand, and Stavanger, as well as the positions in the epic action at Narvik, were occupied and held exclusively by these airborne troops. Since that time there has not been a campaign of any importance in which these air forces have not been engaged in a more or less decisive manner. The invasion of Belgium and Holland, the French campaign of 1940, the Balkan campaign and the invasion of Crete, the various campaigns in Africa, the Allied landings on the coast of France on D-day and later on, and the sacrifice of a division of English paratroops at Arnhem are only too well known to require a description of the operations of these history-making warriors who have already covered themselves with glory in spite of the few years they have been in existence.

The military operations of the present epoch are characterized by the vigor with which great masses of troops are able to move across enormous spaces in a minimum of time. The air arm exercises its destructive action on industrial and other objectives which directly or indirectly affect operations, and achieves victory by the simultaneous destruction both of the enemy's armies and of his material resources, or by the demoralization of the population of the enemy country. These are the exclusive effects of the employment of the air force which, with its power, speed, and universality of employment, is able to act at a distance from the war zone and operate with the greatest of violence over the entire front.

I have always believed that one of the reasons why we fight so well in the air, on the sea, and in tanks, and that why our infantry has always been world-famous in defense, is that we are physically lazy, and, if we have to fight, we like to do it with as little effort as possible. This laziness has encouraged us through history to look for a means by which we can be carried into the fray. In early days it was the chariot; now it is the airplane and the tank.

—General Sir Frederick Pile

Notes on Street Fighting

Translated and digested at the Command and General Staff School from a Russian article by Lieutenant Colonel V. Iakovlev in "Krasnaia Zvezda" (Red Star) 26 July 1945.

THE mission of the battalion was to surround a formidable stone barricade and to seize a Berlin city block. Tanks and self-propelled guns attached to the battalion opened fire on the barricade. Direct-laying guns shelled the corner buildings, while the mortars bore down on the street intersection back of the barricade.

Under cover of these fires, our submachine gunner-scouts and sappers crawled over to the corner buildings, threw hand grenades into the cellars, rushed inside, and engaged the enemy submachine gunners and *Panzerfaust* [German bazooka] men.

The self-propelled guns soon broke passages through the barricade. Tanks and direct-laying guns began firing on the upper stories of buildings and along the street. Taking advantage of this reliable cover of fire, the submachine gunners quickly approached the barricade from two directions, and with hand grenades wiped out its defenders. Then, under cover of self-propelled gun fire, the tanks moved ahead.

Drawing up to the barricade, they occupied firing positions directly in front of the passages made by the self-propelled guns and began shelling windows and basements. After the first few shots, the submachine gunners ran to the doors and windows of the next two houses and threw in hand grenades. As soon as the men had broken into the buildings, the tanks concentrated their fires on the adjoining buildings.

The barricade now had to be taken apart to permit passage of tanks and self-propelled guns. The sappers thoroughly checked the surrounding area for land mines and, protected by the submachine gunners, went to work on the barricade. The passage was soon cleared, the tanks moved beyond the barricade, and the submachine gunners were now ready to start attacking the succeeding buildings.

It is evident from this account that, in order to seize a barricade blocking the entrance to a street, thorough cooperation between the submachine gunners and the supporting weapons is essential, and that the enemy should be immobilized to a great depth by continuous and intense fires brought down on the adjacent buildings.

The advance along a street should be carried out by only one assault group. If this is done by two groups, each with one independently operating submachine-gun unit, there will be too many men on the street, and hence an unnecessary loss of life. Moreover, it is quite difficult to coordinate the work of two detachments accomplishing one and the same mission. It is best, therefore, to have only one group under the command of the battalion commander himself.

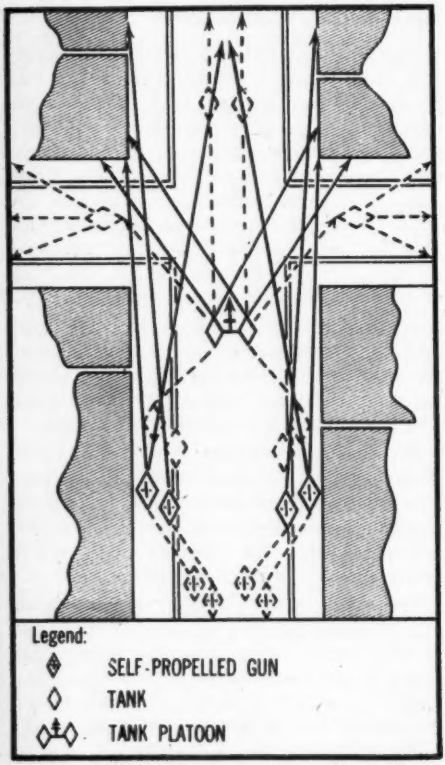
Success in street fighting is determined, first of all, by skilful cooperation between the submachine gunners and the mobile weapons, i.e., tanks and self-propelled guns. The basic factor here is mutual fire cover.

In order to gain control of a large city block, eight to ten large buildings on each side of the street must be taken. At the same time, friendly troops should occupy the adjacent streets. An advance along only a single street is doomed to failure.

The submachine gunners of the assault group operate along both sides of the street simultaneously. Here, too, the determining factor is proper cooperation with tanks and assault guns. Thus, when our men attack the houses in the middle of the block, the tanks move over the sidewalks and fire at buildings on the opposite side of the street. Thus, the tanks have definite sectors of fire. The self-propelled guns advance in echeloned formation, from 100 to 200 meters behind the tanks. Such a formation is necessitated by the presence of the enemy's direct-laying guns at the next barricade or street intersection. The self-propelled guns also direct their fires against the distant buildings of

the block, where enemy submachine gunners and *Panzerfaust* men may be hiding. These guns knock down house corners and sections of wall between windows, thus depriving the enemy of convenient cover.

The advance group of submachine gunners occupies only the basements and the first floors of the buildings. They do not clear the upper floors. Instead, the assault group occupying the lower floors, immediately organizes submachine-gun fires directed at the windows of the upper floors. All staircases and elevators are immediately blocked by submachine gunners to prevent the enemy from descending from the upper stories. Thus, the enemy troops are sealed in the upper floors. Simultaneously, the submachine gunners begin storming the neighboring buildings, and when fighting for these buildings has already begun, final mopping up of the upper floors is carried out by a company following the assault group.



The tanks and the self-propelled guns change their positions as the submachine gunners advance. Then comes the fire group and the consolidation group (submachine-gun reserves). Artillery and mortars of the fire group occupy concealed positions and lay fire on the subsequent blocks, intersections, parks, and yards. In case of necessity, the artillerymen fire directly, engaging hostile tanks and self-propelled guns. This fire group also repels enemy counterattacks.

Fights for intersections are somewhat different. Here the submachine gunners have to overcome open spaces which are shelled by the enemy. Especially troublesome are firing emplacements in the corner buildings.

Experience has shown that a group of mobile fire means has to alter its formation when occupying an intersection. The tanks are no longer able to move on the sidewalks, since they may come under sudden fire from beyond the street corner. Moreover, they are likely to be attacked by *Panzerfaust* fire from the buildings on the opposite corners. Furthermore, the tankmen moving on the sidewalks cannot tell what is happening on one of their flanks. It is therefore important that the tanks move over to the middle of the street; here, being out of reach of the *Panzerfaust* fire, they are able to shell both corner buildings of the next block. The self-propelled guns, in groups of two or three, advance now over the sidewalks, and fire along the streets (as shown in sketch) on their respective corner buildings and on the hostile firing emplacements beyond the barricade.

Men with light machine guns ordinarily fire from the second floor at the windows of corner buildings and of the neighboring buildings, while the submachine gunners, divided into small groups, wait for the signal to rush forward. The fire group, a howitzer battery and a mortar unit, fires on the distant firing positions and prevents the approach of the enemy's reserves.

After a short but intense period of firing,

the sappers and scouts cross the intersection. They toss hand grenades into the windows of the basements and first floors, and light smoke pots on both sides of the cross street. The area thus occupied is then expanded by a small group of submachine gunners.

The enemy, blinded, is no longer able to deliver aimed fire. Then the main group of submachine gunners runs across the street and takes possession of the corner buildings of the blocks. Seizure of the corner buildings allows the tanks to move ahead and to lay fire on the subsequent buildings. One of the tanks fires along the street in order to cover the flank of the assault groups. From here on, the men and the vehicles assume the formation used for the advance along the street.

Future Warfare and the Atomic Bomb

Digested at the Command and General Staff School from an article by Captain Russell Grenfell, Royal Navy, in "The Navy" (Great Britain) October 1945.

How will the atomic bomb affect future warfare? Many opinions have already been expressed on the subject, most of them sensational. It has been said that the advent of the new bomb means a revolutionary change in the basic nature of warfare. Two fearful explosions knocked Japan out of the war and thus eliminated the necessity for a landing on Japanese soil and avoided the heavy loss of life that would have been incurred in the final defeat of the Japanese armies. This tremendous fact meant, or so many commentators including some notable public figures have averred, that armies, navies, and air forces are now obsolete and can be relegated to the nearest museum. Wars, if there are any more wars, will be decided by atomic obliteration. But the power of the atomic bomb is so devastating and terrible that it is more than ever necessary to prevent wars breaking out. Otherwise, mankind might well destroy itself altogether; for there is no escape from atomic explosive. To quote a leading newspaper, "so far as human foresight can divine, the powers of destruction have now gone beyond the possibility of defense." It is, therefore, essential in many people's view that there should be "effective control over the atomic bomb," some international authority for the purpose being a popular suggestion.

Are these opinions to be regarded as sound? It has to be remembered that the atomic weapon came upon the peoples of the world out of the blue. Not a whisper of its existence had previously reached the general publics of this or any other country. Then, all of a sudden, came the terrific news that not only was atomic explosive an accomplished fact but that it had actually been used to wipe out a Japanese city with immense loss of life. In such circumstances, there was every likelihood that the first psychological reaction to the new weapon would be highly emotional and therefore unbalanced.

The premise, for instance, that Japan was knocked out of the war by two atomic bombs is distinctly questionable.

On the evidence, it cannot be said with any certainty that the atomic bomb knocked out the Japanese by itself. The most that can be claimed for it is that it completed the discomfiture of an already defeated nation.

On the other hand, if the decisive and revolutionary nature of the atomic bomb is not proved by the Japanese experiment, it is not disproved. The assertion that armies, navies, and air forces are now museum pieces has still to be examined in detail. Let us assume that the world's soldiers, sailors, and airmen were all disbanded. How, then, would nations knock each other out by atomic explosive? They could only do so by long-range gun or rocket fire. As long as the secret of atomic explosive is known to one nation or set of nations only, this might be possible. But such secrets have never remained long in the pos-

session of any one group. We can be quite sure that the Russians, the French, the Spaniards, and any other free and independent countries are now feverishly at work in the endeavor to catch up with the Anglo-American advantage; and one of our own scientists has declared that it should take no more than five years for the atomic discovery to be made by any nation that is in search of it.

If war is delayed for five years, therefore, we can expect both sides to be equally equipped with atomic explosive. In that case, wars in a world without navies, armies, and air forces would presumably be fought by reciprocal obliteration of opposing cities and civil populations through the agency of atomic missiles shot from launching platforms in the territories of the two combatants. But under these conditions it would inevitably occur sooner or later to one side or the other that if the launching sites could only be captured and occupied, either by ground invasion or by air- or seaborne troops, the enemy's bombing would come to an end and the just cause would prevail. But, if so, here are armies, navies, and air forces coming back on to the stage—on one side at least. And since the other side, if it were any use at all, would anticipate such a move by the enemy or, more probably, contemplate it for itself, it is reasonable to assume that the old-fashioned armed forces would be maintained by all.

And if armed forces exist, they will naturally be used. Were, say, France and Spain to be engaged in pulverizing each other's cities with long-range atomic bombs, it would still be possible for a French (or Spanish) army to carry out an ordinary normal invasion of the enemy country which, if successful, would be just as efficacious in winning the war as the pulverization of its opponent's cities.

The answer to such a move might be to switch the atomic artillery from the city targets to the invading army; and thus we are brought back to first principles of strategy and to the traditionally higher value of making the enemy's armed forces the objective in preference to the more primitive idea of "cross-raiding," which is what "strategic bombing," whether by piloted or pilotless missiles or with amatol or atomic bombs, really is.

Established principles are, however, always unpopular on account of the familiarity that brings them into contempt. Humanity loves novelty, especially when it is dramatic and exciting, a psychological characteristic which goes far to explain why so much enthusiastic support was given to the air strategists who declared early in the war that armies and navies were costly encumbrances and that the war would be won by bombing. But, with prosaic fidelity to ancient rule, the war against Germany was not won until the German armies had been beaten in the field; nor the war against Japan until the Japanese Navy had lost the command of the sea. In any case, a defeated country has to be occupied, a task that can only be carried out by trained soldiers.

Whether and how atomic bombing will be used as part of military operations remains to be seen when the next war comes. It can be argued that the bomb's power is so great and its blast effect so extensive that its employment anywhere near the front line would be as dangerous to friend as to foe. No doubt it will be used, as with "tactical" air bombing, for back-area "preparation." In this way, it may add still further to the immense destruction that aerial warfare has brought in its train or it may not be used at all. It is conceivable that the fearful destruction of life that accompanies the use of atomic bombs may cause warring nations tacitly to keep them in leash, as they have done in this war with poison gas.

But it would undoubtedly be optimistic to suppose that the power of the atomic bomb will frighten humanity off war altogether. Not only are aggressor nations invariably confident of victory and therefore indifferent to the risks involved in going to war, but the adaptability of mankind to the dangers of existence on a dangerous planet is almost infinite. The capacity of Londoners to withstand enemy bombing in the way they did

would not have been believed before 1939; and it is proverbial that new hazards which cause alarm to one generation are the accepted commonplaces of the next. A hundred years ago, Lord Cochrane, one of the bravest, most original, and seasoned of warriors, thought the idea of poison gas so diabolical that he cloaked it in sealed codicil to his will, with the instruction that it was only to be opened in the moment of Britain's direst extremity. Today, we think more composedly of gas, among other reasons because, vile as it is, we have learned how to counter it.

The latter consideration must surely also apply to atomic warfare. So far, history has always shown countermeasures being devised to meet and limit the effects of all new weapons. The very wonder attaching to atomic explosive suggests that what scientists have accomplished in one direction they may also achieve in the opposite. Who knows whether some ray may not be produced for neutralizing an atomic missile in flight? Or, if not that, that a countermissile of the same kind may not be sent speeding up and radar-directed on to the approaching rocket bomb to explode it harmlessly at a high altitude? The idea that there is no defense against atomic bombing is probably as fallacious as Lord Baldwin's famous dictum that "the bomber will always get through," a prediction that the discovery of radar shortly afterwards rendered invalid. Indeed, in some respects, atomic explosive may actually have increased security, for it may well prove the deadliest antidote to the hostile bomber aircraft.

But the more purely defensive countermeasures also demand attention. Passive defense has always played an important part in opposition to any form of attack, as Lord Fisher found to his and our cost when he thought speed could be a satisfactory substitute for armor in his early battle cruisers. The result was that three of them blew up at Jutland, in spite of their heavier gun armament. It is a weakness of ours in this country to neglect this defensive aspect of warfare. Our battleships have been generally less well protected than the enemy's. Our tanks in this war have had thinner armor than the German. Our Air Force was dangerously late in adopting self-sealing petrol tanks. Having armed our merchant ships against the submarine in 1917 and 1918, we scrapped the whole organization after the war and had to build it up again from zero after 1939.

In anti-bombing defense, we have been equally behindhand. The question of public air raid shelters was only played with by comparison with what was done in Germany. Not only with their massive concrete "bunkers" but also with underground and hidden factories and the dispersion of factory plants, they were a very long way ahead of us; and had we been subjected to the terrible bombing that they had to undergo we should have suffered proportionately much more heavily than they.

The coming of atomic explosive throws a lurid and urgent emphasis on our general slackness in these defensive matters, since the consequences of unpreparedness will be desperately serious. It is unquestionable that the implication of atomic bomb power is underground existence, and we should now be hard at work putting our factories, airfields, harbors, and dwelling houses below the earth's surface and inside hillsides and cliffs. Yet it is noteworthy that the Government's housing policy shows not the faintest awareness of any such necessity.

It will naturally be said that the cost of such a revolutionary development would be fantastic. Quite correct. But no price is too high for national survival, and we need to face the fact that small, densely populated, and highly industrialized Britain is peculiarly vulnerable to atomic warfare. By comparison, Russia has a natural protection by virtue of her huge area and the wide dispersion of her population and industries. Her war factories behind the Urals, for instance, are 2,500 miles from her present western boundary; whereas Britain is only a few miles from the nearest foreign territory.

It would be the height of ostrichism to imagine that we can rely on any form of international control for our defense against

atomic attack. Security Council or no, so long as an atomic bomb factory exists anywhere in the world, whether in the U.S.A., Russia, China, or where you will, the land forces of its country of location will have the real control over its utilization, and will assuredly not hesitate to insure exclusive national possession of it in times of emergency.

We have played with fire many times in our past history in the way of under-preparedness for war, often with a near approach to disaster as a consequence. To play with atomic fire in the same way might be fatal.

Principles of Coastal Defense

Translated and digested at the Command and General Staff School from a Spanish article by Major Narciso Ariza García in "Ejército" (Spain) January 1944.

IF we compare coastal defense with normal defense on a land front, the following differences become apparent:

1. Defense is imposed by the geographical medium. No matter what the decision of the command may be, we must always protect the coast from possible and probable landings. Organization and garrisoning are essential.

2. Normal land defense entails the organization of a position so that it is covered by another advanced one; while on the coast both of these coincide, and the security of the installations is entrusted to the aerial and naval reconnaissance organizations and the vigilance of a complete network of ground observation.

3. In order that the enemy may set foot on the position, he has to effect a landing.

4. A soldier who occupies a position on the coast is not under the vigilant eyes of the enemy. This moral aspect should be emphasized on account of the influence which a prolonged stay in a coastal position exercises on the efficiency of a unit.

Naval Landing Operations

Naval landing operations consist of three phases:

1. The transportation of the forces.

2. The landing for the purpose of establishing one or more bridgeheads.

3. Successive operations for the purpose of uniting the partial landings and penetrating into the interior to the strategic objectives indicated by the command.

In the phase of disembarkation, the troops transfer to landing boats or barges. Speed and surprise are factors necessary for success. A daring spirit, perfect training of the forces, and experienced commanders who are not lacking in initiative are the basic elements of success. If the attacker is successful, the units reorganize and new elements land to feed the advance until a zone is reached that will permit the artillery and services to be landed in ports.

As soon as the forces are organized the operation passes to the third phase which is nothing more than normal combat. An aerial landing is first effected with reduced nuclei of parachute troops with the mission of seizing coastal and antiaircraft batteries, transportation centers, communication centers, command posts, etc. The landing is supported by a violent air attack against enemy aviation and airdromes.

The Geographical Medium

In the examination of the geographical medium, we have to consider the three elements: sea, air, and land.

The sea is influenced very directly by atmospheric conditions and its bottom. On every coast there exist zones that are prohibitive to navigation. From the sea it is impossible to observe fortified works, moving troops, or naval forces in ports. From the point of view of fire, the advantage is also with the defense, because of the better observation and because a hit on a ship may suffice to put it out of action; while the pre-

cision of naval fire does not permit putting a coastal battery out of action so easily.

The air forces will be the ones charged with the mission of the aerial bombardment of naval bases and terrestrial objectives, for it has been fully proved that air bombardments are superior to naval ones. The basis of antiaircraft defense is a perfect network of terrestrial defense coupled with air and naval reconnaissance which act as advanced observation posts, informing the defense command of the approach of hostile air or naval forces.

The study of the shore must be made from the point of view of the possibilities it offers for landings. In conformity with this idea, the coast must be divided into:

1. Fronts where landings are probable (active fronts).

2. Fronts where landings are possible but not probable (fronts that must be watched).

3. Sectors of the coast where landings are impossible (passive fronts).

But it does not suffice to study the terrain in the coastal areas only. One must go farther than that in order to gain a knowledge of the best approaches leading to the most important objectives: ports, bays, inhabited places, traffic centers, industrial and agricultural zones, and—as main objectives—naval bases.

The occupation of the bases has always been effected by means of ground attacks, and the seizure of a base well armed with artillery is a very difficult operation that will result in heavy losses.

The Organization of Defense

We deduce from the foregoing study that coastal defense comprises two different phases:

1. The defense of the sea area.

2. The ground defense of the shore.

In the first phase, the battle is essentially a naval and aerial one, and in the second, the battle becomes general and attains its maximum intensity when the enemy lands his ground forces on the shore in order to establish himself in bases to be used as points of departure for subsequent operations.

The whole of the coastal front will be divided into coastal defense zones, each one of which should cover a perfectly defined geographical area. Each zone, in turn, will be divided into sectors. Normally there will be both active and passive fronts, and each sector will have to do with defense against a single direction of penetration.

A coastal sector must be garrisoned by a large unit (an army corps or a division). It will be in charge of the coastal defense and antiaircraft batteries located within its zone of activity.

The commander of a zone will have at his disposal the air and naval forces assigned to him, which should be: air forces (local reconnaissance units and fighter units) and naval forces (light surface units and submarines to interfere with and render difficult navigation in the immediate vicinity of the coast). The naval forces will have charge of the fixed defenses, minefields, and networks of defenses near the ports and naval bases.

The large units assigned to each zone will provide the personnel for the sectors, and some of them will remain in reserve at the disposal of the command.

The commander of a coastal sector will divide the latter into divisional sectors, if he has several divisions at his disposal; and the dvisional sector will be divided into subsectors. As a general rule, they will not exceed two, each garrisoned by a regiment, leaving the third regiment as a sector reserve.

Defense Positions

The defense position has as its mission the prevention of hostile landings and support of the fire of the coastal batteries. It should be established on the shore in order to have the obstacle, the sea, in its field of fire.

On the active fronts the defense position is a deep zone with small strongpoints scattered over it, carefully chosen and organized, in order that, with their mutual support, a network of fire may be established

not only along its seaward edge but also in its interior and all around its perimeter.

In the zones where a watch is to be maintained, smaller positions will suffice in the places where landings are possible, and in the passive zones it will be sufficient merely to patrol the shore.

The reserves of the battalions which garrison the defense position will organize key positions along lines of communications in order to detain or impede the enemy's advance toward the interior.

In the probable directions of main effort the subsector reserves will organize barrier positions, the purpose of which will be to slow down the progress of the enemy and to serve as bases of departure for counterattacks.

Plan of Fire

The defense possesses in fire its principal means of action. The main barrage must be applied over the obstacle, but we have to recognize that there are two essentially different parts of the application of the plan of fire.

1. Fires against ships and landing craft.

2. Fires against the forces that have landed.

During the first part, the fire will be delivered by the coastal batteries, aviation, and naval units. The aviation will initiate the defensive action when the naval units penetrate its radius of action. When the enemy is within effective range the coastal batteries begin their action. The success of the defense depends on discovering the enemy as soon as possible and subjecting him to direct, observed fire. When visibility is bad the barrage should be established close to the coast.

During the second part, the plan of fire will be that of maximum density and all the weapons of the defense, including those of the infantry and field artillery, will participate.

The principal weapon will be the machine gun, which will find its greatest application on the beaches because of the flatness of trajectory and the utter lack of protection afforded by the terrain.

When the landing is made by armored elements there must be established an antitank barrage. The best positions for antitank guns are on the projecting points of land at the sides of a bay. In this way the landing barges can be taken under fire from the rear, even after they have arrived at the beach.

The participation of the field artillery should be limited to the main barrage on the beaches. The fire of these guns will not be very effective against the vessels which transport the invaders.

Counterattacks

Immediate counterattacks must be made by the local reserves as soon as the enemy sets foot on the beaches.

If the enemy succeeds in establishing one or several bridgeheads, the units which are engaged will continue to resist, even when outflanked, and coordinated counterattacks should be made against the flanks of the bridgeheads.

Paratroops

A naval landing operation is usually accompanied by air landings. There will be needed a system of observation posts to cover the sector in such a way that any landing will be immediately detected and localized.

Batteries, coastal positions, communication centers, message centers, command posts, air and naval bases, etc., must be organized into veritable fortresses to avoid being seized.

Special units will be stationed and provided with rapid means of transportation. These units will be armed with light weapons, mortars, automatic rifles, and submachine guns.

Antiaircraft Defense

One of the basic elements of the defense is a perfect antiaircraft defense network. The plan of antiaircraft defense should be left to the commander of the coastal zone, who will assign the available equipment

to the different points in accordance with the importance of the sectors and will determine the support and cooperation of the three arms, air, ground, and naval.

Air-Warning Service

The coastal air-warning service requires an ample network of communication lines. It should be a telephonic network, complemented by light signals and radio.

Summary

1. The defense will take place on the coast, being supported from the sea and by a coordination of the three arms: land, sea, and air.

2. The land along the sea coast will be divided into zones under a single commander and with elements of the three arms. The zones will be divided into sectors manned by large units.

3. The forces deployed along the coast will be a minimum, a large part of them being in reserve.

4. The security of the deployed forces must be sought in perfect observation and in an information service under the jurisdiction of the zone.

5. The perfection of the defense should be based on a perfect study of the plan of fire and energetic action on the part of the reserves.

6. In all units there should prevail a great spirit of aggressiveness, all static ideas being put aside.

Five Years of Airborne Development

Digested at the Command and General Staff School from an article in the "Royal Air Force Quarterly" (Great Britain) September 1945.

WHAT have we learned in the five years of airborne battle and preparation for battle? What place have these new forces attained in the modern army? What trends have been revealed in their development?

The answers to all these questions take us back to three years before the war—to 1936, when the Russians gave a demonstration of military parachuting. The only power to realize the full significance of that lesson was Germany. The Russians themselves did not develop it, and still have not used it to any extent in actual warfare.

Germany reacted quickly. The first German parachute regiment was formed that same year, towards the end of 1936. In addition, German experts were working on designs for a paratroop and troop-carrying glider. By 1939 the one parachute rifle regiment had been expanded to an air division, with its own transport aircraft and with gliders capable of carrying ten men with their weapons.

When war broke out, therefore, Germany had stolen a march on every other power in capacity for airborne warfare. She had designed and tested a suitable parachute, and she also had, ready for use, a troop-carrying glider. But she had no intention of revealing the full extent of her new weapon until the time was ripe. In Poland, in 1939, parachute troops were used, but more to complete their training in actual wartime conditions than as an integral part of the invading force. It is believed that they accomplished little, and that little was kept a close secret.

It is evident, however, that the tests under fire in Poland had fully satisfied the German High Command. Airborne troops played a bigger role in Norway. Carried in Ju 52's, they easily secured the airfields at Oslo, Stavanger, and Trondheim. Once more their successes were screened from the outside world, although British and Norwegian troops were able to disclose enough to cause grave concern in this country [Great Britain].

It was in May 1940, that the Nazis played their carefully concealed trump card. Airborne forces were used on a scale never before known and it was due largely to them that the Dutch were overcome with such tragic

speed. In the main, the object was to seize the airdrome near Rotterdam, fly in airborne troops to hold it, and then strike against the defenders' rear. The plan worked to perfection. Between ten and twelve thousand troops, it is estimated, were successfully landed.

For the operation the Germans used an infantry division reduced to under 7,000 in number, and trained for the airborne role. Apparently only about 300 aircraft were mustered, but, skilfully used on a shuttle system, the effect was equal to 600 aircraft in three waves on the first day, and 250 aircraft in two waves on the second day. Losses both among the parachutists and the airborne infantry were heavy, but were amply justified by the results.

No gliders were used in the Rotterdam operation. They were kept for reinforcing the parachutists' assault on the Belgian forts along the Albert Canal. The capture of Fort Eben Emael, strong, modern, and believed to be almost impregnable, was the most striking success. It was achieved by parachutists landing in places above the elevation of the fort's guns. Aided by engineers with flame-throwing equipment and explosives landed by gliders, they were able to blast and burn out the defenders from above.

The invasion of Holland is an old story now, but it has been recalled in some detail because of two very important factors which resulted: first, it sounded the final alarm which galvanized Britain into action, and, secondly, it provided a model of German airborne warfare procedure from which they afterwards never greatly varied.

Lessons of Crete

The first operation ever undertaken by British airborne elements—apart from isolated drops in enemy territory for secret purposes—was in southern Italy in February 1941. It was on a very small scale, involving not much more than a company, and it was intended to blow up an aqueduct near the Sele River in the vicinity of Naples. It was not completely successful, but it afforded valuable experience.

We still had many lessons to learn, and one of the most important was taught us by the Germans when, in May 1941, they attacked the island of Crete. They used airborne forces on a scale never before known, and, it must be admitted, on a scale not conceived by us. Altogether some 32,000 troops were transported by air, chiefly in gliders towed by Ju 52's, as in Belgium. Fighters were provided to afford cover to the gliders and towing aircraft, but, in view of the small air opposition, proved, in the event, to be hardly necessary.

The Germans made two bad mistakes. They dropped their troops on the best-defended points, and they did not always drop them within reach of their equipment. The idea of the drop was to smother the strongpoints first, but in fact the result was to insure that the parachutes and gliders were within range of the most concentrated fire at the worst possible time, that is, when preparing to reach the ground. Many were killed or wounded in the air, and still more while trying to reach their equipment on the ground. Despite these losses, Crete fell, and its fall was largely due to another new development in airborne warfare, the dropping of heavy weapons, including mountain guns, by parachute. There were, then, four lessons for us as a result of Crete:

1. Paratroopers should be dropped *around*, and not *on*, their target;

2. A better method of dropping equipment near them must be found;

3. Heavy equipment could be dropped; and

4. Strongly-held bases could be captured by air alone.

This last point was emphasized by the capture of the Ishmus of Corinth, which fell to parachutists alone.

The success of the Germans on Crete convinced those who had still doubted the value of airborne troops. Expansion in this country proceeded rapidly, and the provision of equipment improved. By September 1941, the First Parachute Brigade was in being, followed soon afterwards by an Air Landing

Brigade. It was true we were still not much in advance of the position the Germans occupied at the beginning of the war, but we had the inestimable advantage of being able to profit by all the mistakes that had been made by ourselves or by the enemy. That we had in fact profited was soon proved by the success of the Bruneval episode.

Bruneval and the First Big Operation

The raid on this radiolocation station on the French coast was a complete success. Of the force dropped only one man sprained an ankle, and that did not prevent him from fighting and getting away again. The number dropped comprised a company, and their mission was to seize the radiolocation station equipment and bring it back for examination in England. They secured the vital apparatus and brought it back with a minimum of casualties.

In November 1942, the invasion of North Africa saw the first large operation by British airborne forces. That operation can be said to mark the turning point in the airborne war. Until then we had only developed from the stage of not possessing an airborne weapon at all to the stage of having forged one and of having learned its use. From now on we were to test our steel in earnest.

A parachute brigade of the 1st Airborne Division took part in the African operation. The objectives were to capture the Bone and Oudna airfields, and to assist the French in ousting the Germans from Souk el Arba.

From now on the lessons learned were rather different. Up to the time of Crete we were concerned with grasping the broad principles of airborne warfare: now it was necessary to learn the finer points, points which could make or mar a whole operation. We had the right weapon, but we had to learn how best to use it. From this aspect, one of the most important points which emerged from the African venture was the necessity for more detailed briefing; for maps, photos, and models of the actual area.

Another factor which was emphasized was the need for training the airborne troops with the aircrews actually detailed to carry out the dropping. Mutual confidence was found to be important. Finally, we now recognized the value of more liaison: an RAF staff actually stationed with the army headquarters to advise on airborne matters.

Meanwhile the total of our airborne forces was quickly growing. While the 1st Airborne Division were winning their spurs in North Africa, the 6th Division was forming in the United Kingdom.

Eventually a Corps Headquarters was formed, with both airborne divisions as well as specialized airborne units under its command. At the same time both the Middle East and the Far East Army commands were raising their own formations.

British Gliders in Action

Sicily was the next testing ground. This was the largest Allied airborne operation which had yet taken place. A whole British airborne division was engaged (as well as an American division), and British gliders were used for the first time. In some respects the experience of Sicily also provided the most valuable lessons. Difficulties which it was thought had been overcome were found to have been underestimated, but at the same time we were able to correct some of our biggest mistakes in earlier drops.

As far as the British division was concerned, the intention was to seize bridges, crossroads, and other important communication points. The task of the First Air/Landing Brigade was to seize and hold the crossing over the waterways at Ponte Grande to operate against the town of Syracuse. The First Parachute Brigade was to capture the river crossing at Ponte di Primosole. All the objectives were attained, but at a high cost, owing to the fact that a large proportion of the Air/Landing Brigade came down in the sea. The chief reason for this was the poor visibility and bad weather, coupled with a number of mistakes in selecting the release point for the gliders.

As a result, it was decided to give aircrews more experience in parachute dropping and glider towing, both by day and by night, and if possible more experience in operating under actual war conditions, in order to insure that they continued on to the correct landing or dropping zone despite diversions due to flak. To assist the air crews in finding the zones, it was realized that they must be marked more clearly with lights and smoke and also with radio aids if available.

It was also found that container-dropping was often unsatisfactory, chiefly because the supplies too often landed in places not immediately accessible to the airborne troops. The Germans had experienced this difficulty in Crete. Better methods of release to insure that the containers fell nearer the men without endangering them had to be found, as well as some means of marking more prominently the spot where they fell.

This problem was actually not fully overcome until some time later. Various devices, such as signal lights on the containers, were tried, but it was not until the adoption of the method of dropping the equipment *with* the parachutist that the problem was really solved. The aim now is to pack as much as possible into a kit-bag actually attached to the airborne soldier, so that he is able to fight as soon as he lands. He then has a much better chance of reaching any extra equipment dropped in containers than he would have if he is virtually unarmed until he finds his weapons.

One other development followed the experience of Sicily—it was realized, as the experience in North Africa had foreshadowed, that the airborne troops could not be regarded as distinct from the infantry. Glider pilots, once they reached the ground, could not be withdrawn immediately. They became, *ipso facto*, part of the fighting force, and they had to be taught to fight on the ground.

British airborne forces had by this time (the autumn of 1943) almost reached the striking capacity they needed for the invasion of Europe. But there was still one surprise shot in the Nazi locker, and it was directed against the Greek island of Leros in November 1943. The feature of this attack, which we did not fail to note and later use in the attack on Normandy, was the heavy and continuous bombardment of our positions, followed by the arrival of the transport aircraft almost as soon as the bombing had ceased. Only a battalion, numbering 500 men, was dropped, but it played a decisive part in the battle and succeeded in cutting the neck of the island and splitting the defense. With their local superiority in the air, the Germans were able to reinforce the parachute battalion by sea and to thrust in bridgeheads of seaborne troops. Within four days the island was conquered.

Detailed Preparation

The most interesting feature of the Leros attack, so far as any reaction on our airborne development was concerned, was that it confirmed the comparative lack of progress in this form of warfare made by the Germans. They were still using the strategy of 1940—to seize a vital point near the area of their main attack, to divert the defenders, and to attack from the rear if possible. The Leros attack was successful because the terrain suited this type of attack, but it showed an encouraging lack of adaptability. To those "in the know," it was clear that in airborne strategy we had now advanced beyond the Germans. We lost Leros, but we gained confidence.

Seven months later, with the coming of D-day, the airborne army proved that that confidence was not misplaced. From early in 1943 the 6th Airborne Division had been training, and by June 1944 they were ready for the big operation. Every important lesson of the previous four years had been remembered. Everyone down to the lowest rank, knew by heart the exact locality in which he was to land. They had seen photographs and models both of the landing zone and the surrounding country. They knew the RAF crews and had trained with them. Arrangements had been made for the clear indicating of drop zones and landing zones. Heavy equipment, including tanks, and 16-pounder and

17-pounder antitank guns, was to be carried.

At 0020 hours on D-day, 6 June 1944, various sections of a specialist parachute company landed on their allotted drop and landing zones, to mark them for the arrival of the main bodies later. The main body duly arrived at 0100 hours, but owing to bad weather and poor visibility dropped their paratroops or released their gliders over a wide area, as well as in the selected zones. This delayed the concentration of the airborne forces but had the unexpected and very valuable result of confusing the Germans for some time as to where the main attack was to be launched!

The Air/Landing Brigade did not fly in till 2100 hours on D-day, using Horsa and Hamilcar gliders and carrying the heavier equipment, such as tanks and guns.

The object of the 6th Airborne Division was to guard the left flank of the Allied armies, which was bounded by the Orne river and canal. All the bridges were seized intact. In addition, parties of airborne troops were crashlanded right on to their objectives, such as the coastal gun battery at Merville, and these also very largely succeeded in their tasks.

Normandy was a complete justification of our airborne policy. We had proved that, correctly handled, our troops could seize objectives against which a direct attack would have been prohibitive in cost of men and material. We had proved that intense training had produced glider pilots capable of landing with great accuracy. The Hamilcar had successfully passed its first big test.

Improvement and Adjustment

But we had also found several other features which needed improvement and adjustment. It was undesirable, for example, to assign to one airborne unit a task vital to the whole operation. In apt phraseology, there should be several arrows to every bow. Again, individual navigation by aircrews, if properly trained and briefed, was more productive than the follow-my-leader system, where one mistake by the leader could nullify the effort of a whole force. Deficiencies in the armament of the airborne divisions were found. They needed more antiaircraft armament, more counter-mortar fire power, and an air support unit. All these lessons were duly learned and later brought into effect.

Gallant Attempt

Armed with this new knowledge we attempted in September 1944 the largest operation yet undertaken by Allied or enemy airborne forces—the attempted breakthrough at Arnhem.

Two American divisions and one British airborne division, together with one Polish Brigade, were involved. The American operation was a complete success, but the British objectives, though pressed home with great gallantry, were not achieved.

Attempts to re-supply the troops landed were only partially successful, chiefly owing to heavy enemy flak. This was one of the most valuable lessons learned at Arnhem—the fact that close air support must be available to protect supply aircraft from enemy ground action.

The other big factor emerging was that to be fully effective at once, an airborne division must be put down in one lift. Otherwise a good proportion of the strength for immediate operations is lost.

Between the operations at Arnhem and the Rhine, when British airborne forces achieved their crowning success, the Germans made a last attempt to turn the tide of war with the assistance of their airborne arm. In December 1944, the Nazis launched the offensive in the Ardennes.

About a thousand parachutists were dropped by night—the first German attempt at a night operation, and a particularly unsuccessful one. Only 300 of the 1,000 ever reached their objectives. They were handicapped by ignorance of the Allied positions due to lack of aerial reconnaissance.

The Final Triumph

In March 1944 the Allies launched the latest airborne operation as part of the cross-

ing of the Rhine. This time we did not make the mistake of leaving too long a gap between the ground forces and the airborne troops. This time, too, the link-up took place in a few hours, making it the most concentrated airborne attack in the history of warfare. Two airborne divisions were landed in one lift over a period of about three hours, using some 1,500 aircraft and 1,300 gliders. Instead of the assault taking place *before* the main crossing by ground troops, surprise was achieved by not attacking from the air until several hours afterwards.

The lessons of Arnhem had been well learned. Immense cover was given by the Tactical Air Force. Flak positions were effectively neutralized so that they could not interfere with airborne operations. In addition, enemy airfields in the area were put out of action.

Reviewing all these airborne operations since the modest beginning in Italy in February 1941, two principal trends become apparent:

1. The carrying by air of increasingly heavy equipment.

2. The extension of airborne warfare from daylight to darkness. (It must be noted, however, that this trend was finally reversed. Sicily and the first part of D-day and Arnhem were carried out in the dark. The second part of D-day and Arnhem were carried out by day—Ed.)

The first trend needs little emphasis. From the beginnings, when only light guns were thought sufficient, we now have the Horsa carrying a 6-pounder gun and a jeep, with crews for both. The Hamilcar carries the 7½-ton tank with crew. There seems no logical reason why, in the course of time, the problems of lifting and successfully landing even heavier weapons may not be overcome.

The second tendency is one of the major reasons for our superiority over the Germans. They had only one experience of night operation, and that was conspicuously unsuccessful.

There were other reasons for our superiority. Our parachutes were better than the ones used by the Germans; the latter had, for example, no quick-release device equaling our own. Naturally, many factors affecting a comparison cannot be mentioned, but it can be said that our scientific devices for enabling aircraft to locate the correct landing zones and drop zones were far more accurate than the enemy's.

Conclusions

The truth is that although we have brilliantly overtaken the start gained by other nations at the beginning of the war, and although we have been receptive in our ideas, the use of parachute and glider-borne troops is even now so recent as to be still in the experimental stage. Development has been so rapid, and potential developments are still so varied, that it would be idle to set an arbitrary limit on the possibilities.

It is more profitable to recount what we have so far established to be the cardinal principles for success.

Chief among these is that the attacking army must have *local* air superiority. General air superiority can be disregarded, as the experience at Leros showed. Next, the number of tugs and gliders must be enough to transport the whole force as far as possible in one lift. The partial failure at Arnhem and the success over the Rhine demonstrate this.

But the one vital factor is weather. No matter how ingenious the devices to attract the aircraft to the correct zone, if the weather is bad and visibility poor, men and supplies are bound to go astray. And finally the most important principle of all—the airborne arm must not be expected to do too much. They must be dropped and landed in zones within reasonable reach of the attacking ground troops. Tunis and Arnhem were the operations which established this limit of prudence.

There are, of course, many other factors which must be taken into account if an operation is to succeed, but these four may be considered the most important. And of these the most unpredictable is the weather. Within human limits, it is possible to insure air

superiority and sufficiency of aircraft. It is possible to plan an attack so that link-up with the ground forces is not long delayed. But it is not always possible to know in advance what sort of weather will prevail throughout the attack, particularly if it lasts several days. Therein lies the real Achilles' heel of the airborne soldier in his present stage of development. Compared with the ground fighting man, he is in the same relation as the airplane to the tank. Sooner or later, with the development of scientific devices, this handicap will be overcome, but at present it must be taken into serious account.

The Brazilian Expeditionary Force in Italy

Translated and digested at the Command and General Staff School from an article by Frank V. Norall in "O Observador Militar Interamericano" July-August 1945.

THE Brazilian Expeditionary Force was a complete infantry division, organized and equipped exactly like any United States Army division. It was composed of three infantry regiments—the 1st, 6th, and 11th along with their divisional artillery, which was composed of three 105-mm groups and one 155-mm group.

In addition to this, there were several thousand officers and men for the replacement of casualties, supply personnel, doctors, nurses, and others. The total number of Brazilians in service in Italy was approximately 25,000. The Brazilian Air Force was represented by a pursuit group composed of nearly 300 officers and men.

The Brazilians arrived in Italy divided into combat teams. The 6th Regiment arrived first, and went into action at the foot of the Apennines northeast of Pisa.

Shortly afterward other elements began to arrive and the entire division was placed in action under the command of General João Batista Mescarenhas de Moraes. At that time, the Brazilian troops were defending a sector about fifty kilometers southwest of Bologna.

This sector was of considerable strategic importance and a very difficult one to hold. It was important because it flanked the highway leading to Bologna and difficult to hold for the reason that the terrain was sloping and the enemy held nearly all the elevations, which left the Brazilians exposed to excellent artillery observation and fire.

Their first objective was the seizure of the Monte Castello from which the whole of their sector could be observed.

On 29 November, the Brazilians attempted to take the mountain, but were forced to withdraw. The attack of 12 December also failed.

The two months which now followed were the most difficult of all. With the two defeats suffered on Monte Castello, the Brazilians felt that their prestige had been considerably lowered, and their tactical situation was discouraging. The enemy continued to dominate the hills and maintained artillery observation posts and positions within easy range of nearly all the Brazilian positions.

To make matters worse, this was the period of the heaviest snows and most extreme cold of the entire campaign. The Brazilians endured the severe cold very well, though it was a thing that had been unknown to them theretofore.

During the winter, the officers and men received additional training and gained inestimably valuable experience in patrol operations and reconnaissance missions.

During these months the Brazilian Expeditionary Force was transformed into a machine which afterwards was to maul seriously the Germans and drive them from the heights.

On 21 February 1945, the Brazilians again assaulted Monte Castello, took the mountain after a violent battle, and effected other advances of considerable extent.

During the subsequent operations, the South American troops took all their objec-

tives, accomplishing their tasks exactly within the prescribed limits.

On 3 March, the 10th Mountain Division (American) and the Brazilian troops again undertook a complicated joint maneuver in order to gain possession of the heights remaining in the hands of the enemy. The ground was firm, the atmosphere very clear and the bombers were able to lend good support to the advance. After three days of violent fighting, the two forces took their objectives and a large number of prisoners. For the first time in many months, the Brazilians were able to look down from a higher to a lower level—where the Germans were.

The sensational spring offensive started for the Brazilian Expeditionary Force on 14 April and did not stop until German resistance had been broken in Italy, early in May.

When the enemy was driven out into the valley of the Po, the Brazilian forces pursued him rapidly and captured the entire 148th German Infantry Division.

A few days afterwards, the enemy forces in Italy capitulated. General Mark W. Clark stated that the capture of an enemy division intact by the Brazilians had been an "appropriate conclusion to the splendid contribution of the Brazilian Expeditionary Force to our victory in Italy."

Naval Aircraft and the Future

An article by R. G. Worchester in "The Fighting Forces" (Great Britain) August 1945.

Two aspects of the Naval Air Arm which are most likely to exert a far-reaching influence on the future role of naval aircraft are: (1) the scope of the administrative organization and capacity for the naval heads to make necessary adjustments to meet the potentialities of modern aircraft, and (2) the resources and ingenuity of the technical staffs both in the Navy and in the industry to provide aircraft capable of operating from ships which will be able to hold their own against any adversary in defense and still retain the power to deliver an effective attack.

The case for the Naval Air Arm rests on its ability to concentrate air power in remote regions out of range of shore-based aircraft at short notice and without warning. Taking the fighters first, it has been found in this war that a 600-mile combat radius (i.e., to Berlin and back from British bases) is, for practical purposes, the most we can make at present. It is therefore clear that there are vast areas all over the world which are far out of reach of shore-based fighters with this range. The case for the deck-fighter is therefore firmly established and likely to remain so indefinitely. Turning to the bombers, the problem is at once more complex. Unlike the fighters, there are few places that the super-bomber (a loose phrase indicating a bomber of over 100,000 pounds gross weight) cannot reach from existing air bases. Super Fortresses and Lincolns can, in fact, rain down 5,000 tons of bombs on the North Pole if necessary. In contrast, the naval bomber can only carry tiny bombs and cannot compete as a strategic bomber. However, against special targets like beach objectives and shipping the naval bomber (in a tactical role) is the only weapon available. The super-bomber may be six or ten hours' flying time away and can be used, admittedly, with devastating effect against even small targets, but the naval bomber, which may be on the spot in an hour or two, can dive-bomb and rocket perhaps a small strongpoint into submission more economically. This has been a function during the war of this type of aircraft. The naval bomber has a more direct application in the post-war years. Keeping existing bases fully manned as bomber stations will be an extravagant way of retaining air power abroad when so

many will be wanted for Air Transport. The threat of air power can be maintained easily by naval bombers.

These facts must be recited in order to show how an efficient Naval Air Arm will fit into the years following the peace and the vital part that the Royal Navy will play at a time when the RAF is adjusting itself to the role of police.

It must be made clear that these advances in naval aviation are conditioned by the progress towards providing high-performance aircraft with facilities for deck operation. It has been found that when a successful shore-based fighter is adapted for deck-handling (like the Seafire) the amount of work is so great that, except as an urgent improvisation, it is almost easier to design the whole airplane afresh. Here is an indication of some of the design difficulties that have to be faced: (1) Wing folding. The parts must be designed so that they weigh only 1.0 percent of the gross weight (a figure of 0.5 percent and lower may be aimed at) and the speed must not be pulled down except fractionally. (2) Provision for catapulting. This also means the structure must be stronger (i.e., heavier) to withstand the additional load of the acceleration. In addition, the catapult spools will stick out and bring the speed down a bit. (3) A stronger undercarriage is required, also an undercarriage with a longer travel to provide better anti-bounce characteristics (more weight involved). (4) Naval radio and radar, which is usually much bigger and heavier than comparable types. (5) A better view for the pilot. At least eight degrees over the nose is wanted, which can mean considerable structural changes. (6) Rocket-assisted take-off gear (RATOG) which is essential on naval aircraft but only desirable on a shore-based aircraft. (7) A number of suitable long-range drop tanks. These tanks must be strengthened internally to withstand catapulting.

What there is left of the airplane can be the same as the shore-based equivalent. The guns can be the same and so can the engine, although an extra speed for the supercharger (making three speeds in all) would be useful for sea-level combat.

So far as the bomber is concerned these fighter requirements also apply, but the bomber must in addition take a torpedo or mine or bomb or fuel. The undercarriage must be tall enough to give adequate ground clearance for the torpedo, which must be positioned so that a release can be made in normal flight. In addition, an observer is usually carried and will continue to navigate the aircraft in future designs, unless (to put it crudely) he can be replaced by a piece of radar which does the same work and occupies less space. The extent to which British developments will make this possible is a separate issue. Incidentally the recently-announced Air Position Indicator will do a lot to provide a simple method of keeping the track of the aircraft which can be followed by the pilot.

Enough has been said to show the degree of skill required to develop the modern naval aircraft. This skill and the necessary industrial exertion must be applied in the most realistic way if naval aircraft can match the terrific performances now being offered by the makers of shore-based aircraft. Only the most active vigilance can prevent the danger of allowing ship and aircraft construction to get out of step. This is fatally easy in the design of wing folding, hangar dimensions, and lift sizes, and aircraft firms should understand the basic problems of ship construction and *vice versa*. Incidentally, no two industries in engineering are more divorced—the principles of ship and aircraft construction are far removed but must work in sympathy. These difficulties must be overcome as the development of aircraft carriers and the aircraft themselves become more and more closely knit into an integral part.

The picture would not be complete without a general assessment of current aircraft that have fought in this war. First the fighters. The Navy took a big risk in assuming that the average young pilot would be able to handle a Spitfire on a deck. The risk was

worth taking and the results are gratifying because the Seafire is still the interceptor with the greatest rate of climb and maneuverability. Its speed is slightly surpassed at altitude by the Hellcat. It owes much of its success to a sturdy construction and with a variety of offensive loads, is reckoned a potent aircraft. Top honors must, however, pass to the American Corsair which, besides being the fastest deck-fighter in existence, can also, if necessary, carry the best bomb-load of any fighter. In addition, it has the most valuable asset—namely, a long range, which is so vital for an escort fighter. Despite its matchless performance at high altitudes it is an easy aircraft to handle on the deck and has proved to be a docile machine when landing.

Of the bombers, the Grumman Avenger is the most powerful. The Helldiver has not been used in the Royal Navy but the Americans have ironed out its teething troubles and now, as a dive-bomber, it is a worthy successor to the Dauntless. The British Fairey Barracuda, with its specially-developed Rolls-Royce Merlin 32 engine, is essentially a Swordfish replacement and carrying a heavier load farther, faster, and higher, it is by far the most powerful naval bomber to be built in this country. The Swordfish acquired a new lease on life by the fitting of rockets under the wings, and although the design is very old, the Stringbags, with rocket missiles, were used with effect in the U-boat war right up to the collapse of Germany. It has had an unequalled record.

The Navy has been seriously handicapped by the lack of a 2,000-horsepower engine. This matter is put right in the Fairey Firefly which now becomes the most heavily armed fighter in any navy. With rockets under the wings its punch is harder still. The engine and the airframe are at the beginning of their life, and the Firefly shows every sign of much further development.

Of the new aircraft announced in America, mention can now be made of the Grumman Tigercat twin-engined fighter with the first tricycle undercarriage specially developed for the Navy. The latest startling piece of news is the announcement that the firm of Ryan is building jet aircraft for the Navy.

It is too early to comment on these innovations—but we may be sure that we, as a country, will keep pace with these advances and gradually, as more and more of the industry is turned over to producing the best we can design for the Navy on top priority, these changes will make themselves felt.

The more I have seen of war, the more I realize how it all depends on administration and transportation (what our American allies call logistics).

—Field Marshal Lord Wavell

THE Military Review is published monthly by the Command and General Staff School, Fort Leavenworth, Kansas, in three languages: namely, English, Spanish, and Portuguese. The Spanish and Portuguese language editions are reliable translations of identical articles appearing in the same issue of the English edition.

Subscriptions may be obtained in the several American Republics as follows:

Argentina
Círculo Militar, Buenos Aires.

Bolivia
Director, "Revista Militar," La Paz.

Brazil
Biblioteca Militar, Ministério da Guerra, Rio de Janeiro.

Chile

Air Forces
Dirección de la "Revista de la Fuerza Aérea de Chile," Estado Mayor General de la Fuerza Aérea, Santiago.

Ground Forces
Estado Mayor General del Ejército, Dirección de "El Memorial del Ejército," Santiago.

Colombia
Sección de Historia y Biblioteca del Estado Mayor General, Bogotá.

***Costa Rica**

Cuba
Sección de Instrucción, Ayudantía General, Estado Mayor General del Ejército, Havana.

***Dominican Republic**

Ecuador
Dirección de Publicaciones Militares del Estado Mayor General, Ministerio de Defensa, Quito.

El Salvador
Dirección Escuela Militar, San Salvador.

***Guatemala**

***Haiti**

***Honduras**

***Mexico**

Nicaragua
Dirección de la Academia Militar, Managua.

***Paraguay**

Peru

Air Forces
Ministerio de Aeronáutica —Gabinete, Departamento de Prensa y Propaganda, Miraflores, Lima.

Ground Forces
Servicio de Prensa, Propaganda y Publicaciones, Estado Mayor General, Lima.

Uruguay
Biblioteca del Estado Mayor General, Montevideo.

***Venezuela**

***Pending local arrangements, mail application for subscription to Command and General Staff School, Fort Leavenworth, Kansas, U. S. A.**